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27.

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# EXPERIMENT STATION RECORD

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## EDITORIAL

### THE FORTY-FIFTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The week of November 16, 1931, found assembled under a single roof in Chicago what is thought to have been a larger number of the men and women engaged in agricultural education and research in this country than on any previous occasion. The registration for the forty-fifth annual convention of the Association of Land-Grant Colleges and Universities, which was in session from November 16 to 18, considerably exceeded 300 delegates and visitors and represented all States except New Mexico. The American Association for the Advancement of Agricultural Teaching, the American Soil Survey Association, the National Association of State Universities, and the American Society of Agronomy added successive groups of specialists with their meetings during the week, and most of those present remained to participate in the Conference on Land Utilization of November 19–21. This conference was called by the Secretary of Agriculture and the executive committee of the Association of Land-Grant Colleges and Universities, and was attended also by large delegations from the U. S. Department of Agriculture, State commissioners of agriculture, and many other agricultural leaders and group representatives. Taken collectively, therefore, an unusual opportunity for an interchange of views and viewpoints was afforded which in itself would have gone far to make the week worth while.

The programs of the respective organizations were likewise of a high order. Although the annual conventions of the Association of Land-Grant Colleges and Universities have now been going on for nearly half a century, each reassembling still finds issues of importance awaiting consideration, presents a fresh angle of vision, and results in an ultimate reinvigoration and stimulation of those in attendance. Long ago the association demonstrated its necessity as an administrative agency for safeguarding the interests of its constituent institutions, but year by year a broader usefulness to the Nation has also been more and more convincingly revealed. This is because the conventions have dealt not only with matters of routine business but have provided a forum for the discussion of many questions of wide appeal in the fields of agriculture, industry, education, and citizenship. It is these aspects of the convention program that have vested the meetings with much of their general interest and broad significance.

The Chicago convention was noteworthy for its contributions in many directions, but perhaps especially for its interpretation of the land-grant institutions themselves, their objectives, policies, and responsibilities. The basis of much of the discussion was the survey completed in 1930 by the U. S. Office of Education, but there were also many references to the theories advanced by the National Advisory Committee on Education, the report of whose recommendations became available too late for extended consideration in the general program.

The keynote of the discussions was sounded in the presidential address of President George W. Rightmire of Ohio State University, in which he reviewed the history of the land-grant college legislation, the social and economic changes which have come about in the Nation since its inception, and the contributions which the land-grant institutions have made to the national welfare. In his opinion the fundamental conception underlying the Morrill Acts was less the upbuilding of agriculture and industry than the provision of a new and more democratic type of education which would overcome the prevailing tendency to class stratification. The Hatch Act he deemed an essential supplement to the Morrill Act, since the experimental work it fostered resulted in a veritable renaissance of agricultural education by providing it with a stream of new knowledge which was sorely needed. Subsequent legislation is likewise to be regarded, in his opinion, not as a succession of fortuitous and piecemeal subsidies but as a well-considered series of acts tending toward a distinctive national system of education. Federal aid and Federal initiative have originated and fostered this system, and any proposal to alter the relationships which have been established must face these facts as well as meet the arbitrary standards of abstract educational theories.

The address of President Rightmire was effectively supplemented by a series of papers occupying the final general session and setting forth the spirit of the land-grant institutions. This task of interpretation, the need for which was early visualized as an integral part of the land-grant college survey, was ably and sympathetically performed by a notable quartet with long executive experience and an intimate knowledge of institutional history and psychology. These speakers were President W. J. Kerr of Oregon, associated with land-grant college administration since 1900; Dr. Eugene Davenport, dean and director of the college of agriculture and agricultural experiment station of the University of Illinois from 1895 to 1922; President Emeritus E. A. Bryan of the State College of Washington, whose administration extended from 1893 to 1916; and President Emeritus W. O. Thompson of Ohio State University, head of that institution from 1899 to 1925 and chairman of the executive committee of the association from 1908 to 1919.

The spirit of the land-grant institutions was interpreted by President Kerr as the spirit of the pioneer, the spirit of progress, and the spirit of service. With full appreciation of their assistance to agriculture through research and adult extension, he found the greatest contribution of the land-grant institutions to be in the education of youth, pointing out that their graduates are being prepared for about 3,000 occupations as compared with the classic trio of the law, the ministry, and medicine when their doors were first opened. Dean Davenport declared these institutions were born of a determination to set knowledge to work not merely for the enlightenment of the individual but for the benefit of society. President Bryan traced the principles underlying their formation to the views of Jefferson, and declared that they were founded for the masses as contrasted with the professional classes hitherto provided for. President Thompson likewise saw in them not copies or imitations of the classical institutions but a new system with a background of its own and designed to meet a distinctive need. The grants from the Federal treasury he regarded as made to the States merely as convenient agencies for carrying out a great national purpose. This purpose has been fostered and developed, and to-day these institutions have earned, he declared, their right to speak in the Nation's councils and to their own place in the sun.

In the absence of the Secretary of Agriculture, his place on the program was occupied by Dr. A. F. Woods, director of scientific work of the Department, who discussed The Scientific Method and Social Welfare. From a consideration of the labor displacements and other maladjustments often resulting from inventions and increased efficiency in production, Dr. Woods concluded that "social planning on the basis of scientifically collected and analyzed facts is essential to the promotion of human welfare." In his opinion this planning will call for the development of trustworthy and effective leadership, for the training of which the land-grant institutions must be looked to, and for the coordination of efforts into a national plan, toward which, "I can assure you," he said, "the National Department of Agriculture will work with you and all other agencies."

An address by Chairman James C. Stone of the Federal Farm Board took up in some detail the problems confronted by that board, especially in its promotion of agricultural cooperation and an improved marketing system. Chairman Stone emphasized the fact that the American farmer, while the world's most efficient producer, still lacks trading power. In his opinion all agencies interested in agriculture must work together to develop better methods of distribution, and he warmly commended the agricultural colleges and experiment stations for their contributions and assistance in this direction.

Aside from Chairman Stone's paper, the convention program dealt less specifically with the economic situation than for several years. The extension subsection, however, discussed the question of changes in programs demanded by the agricultural depression and the engineering section considered wise engineering programs and the depression. It was readily apparent that there was no diminution of interest or of a sense of responsibility as regards these matters. One of the significant actions of the executive body was its authorization of the appointment of a special committee, similar to that of several years ago, to study the agricultural situation in its relations to the land-grant institutions and to formulate such recommendations as might seem desirable.

The findings of the land-grant college survey formed the theme of one entire general session. The conclusions of this survey as to administration were amplified and discussed by President J. J. Tigert of Florida; graduate work by Dr. A. J. Klein of Ohio, who had been in charge of the survey; finance and accounting by Mr. Lloyd Morey, comptroller of the University of Illinois; and libraries by Dr. George A. Works of the School of Education of the University of Chicago. Subsequently, the sections of agriculture, engineering, and home economics gave further attention to those aspects dealing more directly with their respective fields.

The various sectional and subsectional programs also included the usual variety of papers on instruction, research, and extension. Following the practice of recent years, discussion of the research aspects is reserved for a later issue of the *Record*. Space considerations preclude detailed analysis of the contributions on other subjects, but special mention should be made of the numerous papers looking toward the improvement of college and extension teaching, a discussion of land-grant college objectives by Chancellor E. A. Burnett of Nebraska (speaking in the place of U. S. Commissioner of Education William J. Cooper, detained from the meetings by illness), and such diverse subjects as an inquiry into farming as a professional career, commercial prizes for extension work, unemployment and the leisure time of engineers, and the relation of housing to the standard of living in Wisconsin farm households.

The arrangement of the program followed the plan of the previous year, the general sessions terminating on the second day and the convention closing on the morning of the third day with sectional meetings and, simultaneously, a session of the executive body. Unquestionably this plan compresses the proceedings into a shorter period than any other which has been tested. On the other hand, it increases the difficulties of the numerous individuals on the program or otherwise interested in attending the various sections but who also represent their institutions in the executive body, and it provides no means for making known to the great majority of the convention delegates the final action of the executive body. For the first time in many years, earlier decisions of this group were reported to the general sessions by the chairman of the executive committee as opportunity offered and in considerable detail. This information was much appreciated, and if a way could be devised for a similar closing announcement, much of the objection still occasionally heard to the transaction of business behind closed doors would doubtless disappear.

For the ensuing year the presidency of the association was bestowed upon President E. O. Holland of Washington, while President F. D. Farrell of Kansas was chosen vice president. Dean T. P. Cooper of Kentucky was reelected secretary-treasurer, Dean J. L. Hills of Vermont assistant treasurer, and President C. A. Lory of Colorado as a member of the executive committee. Other officers and committee appointments are noted on page 99 of this issue.

Decision as to the time and place of the 1932 meeting was as usual intrusted to the executive committee. Under the schedule in operation for several years, this meeting would be held in Washington, D. C., while 1933 would again see a return to Chicago. If this arrangement is adhered to, the meetings will synchronize with the Bicentennial Celebration of the Birth of George Washington and the Century of Progress Exposition in these cities.

### DEATH OF DR. EDWARD HOPKINS JENKINS

The sudden death on November 6, 1931, of Dr. Edward Hopkins Jenkins has brought to a close a career extended in years and rich in accomplishment.

For nearly half a century Dr. Jenkins was actively associated with agricultural experimentation in Connecticut, beginning as a chemist under Dr. W. O. Atwater in the pioneer station at Wesleyan University in 1875, transferring with it to New Haven in 1877, and continuing uninterruptedly on its staff until his retirement in 1923. He served as chemist and vice director of the station under Dr. S. W. Johnson from 1883 to 1900 and thenceforth as director. He was also treasurer of the station from 1901 to 1923. Following the consolidation of the administrative control of the State and Storrs Stations in 1912, he became director of both institutions and performed a valuable service in coordinating their activities.

At the time of his retirement the work of Dr. Jenkins received extended editorial mention from the pen of Dr. E. W. Allen in these columns (E. S. R., 49, p. 1), and the account there presented needs supplementing chiefly as to minor biographical details. A native of Massachusetts, Dr. Jenkins was born on May 31, 1850. Educated under Johnson at Yale and at the University of Leipzig and the Forest School at Tharandt, Saxony, he received the Ph. D. degree from Yale in 1879.

Dr. Jenkins was author or joint author of many station publications dealing with the chemical composition of fertilizers, feeding stuffs, foods and drugs, experiments in plant nutrition, and the growing and curing of tobacco. In cooperation with others he introduced the practice of growing tobacco under shade in the Northern States, and he was regarded as an authority on this crop. He also collaborated with the Yale medical faculty in an early study of vitamins.

In addition to his immediate station duties, Dr. Jenkins rendered many other public services. He was president of the Association of American Agricultural Colleges and Experiment Stations in 1913, a charter member and early president of the Association of Official Agricultural Chemists and a member of its first committee on food standards, a fellow of the American Association for the Advancement of Science, and a member of a long list of State and local organizations. He was editor for chemistry of the first edition of the Century Dictionary and a contributor, frequently anonymously, to various literary magazines, as well as to scientific periodicals. After his retirement he contributed a section on agriculture to a history of Connecticut. He was an effective speaker, combining, in the words of a recent tribute, "accurate scientific knowledge with an engaging philosophy and a rare gift for humor."

Substantial as were his own contributions, they were perhaps overshadowed by what he accomplished as a leader and inspirer of others. Under his enlightened guidance, the Connecticut Station quietly but steadily grew and prospered. A recent tribute in *Science* by Dr. W. E. Britton points out that "as director and colleague he ever gave sympathetic counsel and encouragement to the members of his staff, but was never insistent or obtrusive." Dr. Britton also states that "as an administrator of public funds Dr. Jenkins was signally successful. He always considered the interests of the taxpayer and ever had the confidence of the people. No public funds were ever expended with a greater union of economy and benefit in the results obtained than under his wise administration."

In all these ways and many more, Dr. Jenkins exerted a timely and substantial influence. He will long be remembered.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**Recent advances in the chemistry of the vitamins** (*Nature* [*London*], *128* (*1931*), *No. 3218, pp. 39, 40*).—A brief summary is given of a discussion on the chemistry of vitamins D, A, and the B complex at a meeting of the Royal Society, Great Britain, on June 18, 1931. Among those taking part in the discussion, which was opened by F. G. Hopkins, were A. Windaus, B. C. P. Jansen, R. B. Bourdillon, and O. Rosenheim on vitamin D; H. von Euler, O. Rosenheim, and R. A. Morton on vitamin A; and B. C. P. Jansen, A. Seidell, R. A. Peters, and B. C. Guha on vitamin B.

**The chemistry of irradiated ergosterol,** A. Windaus (*Roy. Soc.* [*London*], *Proc., Ser. B, 108* (*1931*), *No. B 759, pp. 568–575*).—This discussion of the author's extensive researches on vitamin D was presented at the meeting noted above.

Attention was first called to the fact that in the process of irradiation no state of equilibrium is reached between ergosterol and its irradiation products, as shown by the fact that the highly active antirachitic material as formed is only an intermediate product and is itself gradually converted into inactive overirradiated products, two of which have been obtained in crystalline form and neither of which can be converted into the other. This is thought to indicate that in some phase of the reaction a separation into two photochemical series must occur.

The crude irradiation product differs in physical properties from ergosterol in that it has a much lower melting point and greater solubility and that it is feebly dextrorotatory instead of strongly levorotatory. The chief absorption band is between 265 and 270$\mu\mu$ instead of 248 or 280$\mu\mu$ as originally supposed.

In chemical properties the irradiation product no longer shows the typical reaction of natural sterols of forming a sparingly soluble addition compound with digitonin. It is considered to contain the same hydroxyl group as ergosterol and like ergosterol to have several unsaturated linkages. In regard to the stability of the vitamin, the author is of the opinion that it is much more sensitive to the action of high temperature than ergosterol, but is less sensitive to oxygen than was at first supposed.

Attempts at obtaining the vitamin itself in a pure crystalline state by fractional precipitation of the irradiation products from 10 per cent acetone solutions at —80° C. and by distribution of the irradiated product between gasoline and methyl alcohol were unsuccessful. For the chemical separation, irradiation products free from ergosterol and as free as possible from overirradiation products were allowed to react at room temperature in ethereal solution with maleic anhydride and after 3 days were treated with dilute potassium hydroxide to remove the reaction product. The remaining solution on evaporation of the solvent formed crystals which could easily be recrystallized from various solvents. The crystals were long, well-formed needles melting sharply at 122 to 123° and showing an absorption band at 265 to 270$\mu\mu$. The antirachitic activity of the crystals was twice that of the English standard preparation of irradiated ergosterol. Analyses and molecular determinations showed the new product to be an isomer of ergosterol.

In comparing the crystalline substance with the most active product reported by others, the belief is expressed that the irradiation product of Reerink and van Wijk (E. S. R., 62, p. 804) contains a high percentage of the crystalline substance, but with other products of photochemical reaction. Concerning the recent report of Angus et al., noted on page 9, a footnote is added to the effect that while the two crystalline substances have approximately the same spectrum and the same antirachitic action they can not be identical because of differences in specific rotation. It is considered quite probable, as suggested by Angus et al., that there are several vitamins in the irradiation product, but it is emphasized that the crystalline substance obtained by the author is responsible for a great part of the antirachitic action of the irradiation products.

The question as to what takes place during the irradiation of ergosterol is answered as follows: "I believe that in the photochemical transformation into vitamin D the molecular formula, the alcohol group, and the three double bonds remain unchanged, and that all that occurs is a steric or structural rearrangement which leads to an increase in the spatial size of the molecule. In over-irradiation, on the other hand, the double bonds, which in ergosterol and in vitamin D form a conjugated system, are moved further away from each other. As a result, the power to react with maleic anhydride, the property of being reduced with sodium and alcohol, and the characteristic spectrum disappear. It is easy to understand why the photochemical reaction finally leads to sterols without conjugated double bonds, if it is borne in mind that, in the absence of oxygen, these sterols are no longer attacked by ultra-violet rays of wave lengths longer than 240$\mu\mu$, whereas sterols with conjugated double bonds are sensitive to such rays."

**The distillation of vitamin D,** F. A. Askew, R. B. Bourdillon, H. M. Bruce, R. G. C. Jenkins, and T. A. Webster (*Roy. Soc.* [*London*], *Proc.*, *Ser. B, 107* (*1930*), *No. B 748, pp. 76–90, figs. 5*).—By a method of distillation and fractional condensation in high vacuum, the apparatus and technic for which are described in considerable detail, the authors have effected a partial separation of the irradiation products of ergosterol.

By double distillation, followed by crystallization from alcohol and water or acetone and water, a crystalline product was formed consisting of clusters of rather thick needles showing conspicuous double refraction in polarized light. Measurements of the antirachitic activity of the crystals by the method described by Bourdillon et al. (E. S. R., 62, p. 114) showed them to be of considerably higher potency than the standard solution of irradiated ergosterol used for comparison. The absorption spectrum of the crystalline product (melting point 113 to 115° C.) showed maximum absorption in the vicinity of 270$\mu\mu$, which was more intense the greater the activity of the crystals.

In discussing the relation of the crystalline product to vitamin D, various possibilities are suggested: (1) That the crystals may be an inactive substance contaminated by traces of an intensely active oil deposited on their surfaces; (2) that they may be a mixture of two or more substances of sufficiently similar molecular dimensions to form homogeneous crystals, only one of them being vitamin D; (3) that they may be a loose compound between an active and an inactive substance; and (4) that there may be a number of radiation products all possessing high but unequal antirachitic activities. No claim is made that the crystals are pure vitamin D.

Absorption spectra of the various fractions in the distillate showed that the fractions with the least vitamin D activity were characterized by unusually great absorption at 290$\mu\mu$. It is suggested that this substance is apparently identical with that described by Windaus as formed by the thermal decomposition of the irradiation products of ergosterol at 200°. As a possible explanation of the formation of this substance, it is suggested that one of the initial radiation products of ergosterol is an unstable substance with low absorption and no antirachitic action.

**The effects of further irradiation of the radiation products of ergosterol,** F. A. ASKEW, R. B. BOURDILLON, H. M. BRUCE, R. G. C. JENKINS, and T. A. WEBSTER (*Roy. Soc. [London], Proc., Ser. B, 107 (1930), No. B 748, pp. 91–100, figs. 3.*)—A series of experiments is reported in which ergosterol was exposed to radiations of long wave lengths only and the products formed were exposed, after the removal of the unchanged ergosterol, to radiations of short and long wave lengths. Mixed irradiation products separated by precipitation or distillation were also irradiated, and the absorption spectra and antirachitic activity of the products were measured both before and after the second irradiation.

In the above solutions irridated by short wave lengths there was a large increase in absorption at 280$\mu\mu$, with a simultaneous fall in antirachitic activity. This is thought to confirm the conclusions of Reerink and van Wijk that the substance showing absorption at 280$\mu\mu$ is not vitamin D (E. S. R., 62, p. 804). The rise in absorption at 280$\mu\mu$ of different preparations varied greatly in amount, but showed no correlation with the antirachitic activity of the initial product, thus suggesting that the substance formed in the second radiation is not produced from vitamin D but from another substance formed simultaneously with it in the first radiation. It is thought that the two substances may be formed in constant ratio to each other, thus preventing the concentration of the vitamin from ever rising above the limit determined by that ratio, even if the period of irradiation is so short that practically no vitamin is destroyed.

**A crystalline antirachitic substance,** T. C. ANGUS, F. A. ASKEW, R. B. BOURDILLON, H. M. BRUCE, R. K. CALLOW, C. FISCHMANN, J. ST. L. PHILPOT, and T. A. WEBSTER (*Roy. Soc. [London], Proc., Ser. B, 108 (1931), No. B 757, pp. 340–359, figs. 6*).—Using a modification of the method of preparation developed by Askew et al., as noted above, the authors have prepared on a much larger scale and in a state of increased purity a crystalline substance of high antirachitic activity which they have named Calciferol. The modified technic, an important feature of which is the use of purified nitrogen to prevent oxidation during irradiation and throughout the other stages preliminary to distillation, is described in detail and the physical and chemical properties of the product are summarized, with a discussion of its probable relation to vitamin D.

The compound is very stable in most organic solvents. It crystallizes from about 10 parts of methyl alcohol in sheaves of small needles and from acetone or aqueous ethyl alcohol in long flat needles. The purified crystals have a high antirachitic activity of 20,000 Medical Research Council units per milligram (about twice that of the Council's standard preparation of irradiated ergosterol), a melting point of 123 to 125° C., and a high dextrorotation. The maximum absorption band is at or near 270$\mu\mu$. In striking contrast to the more impure crystals previously formed, the purified substance is surprisingly stable when stored either in vacuo or in dry air. The molecular formula, as determined by microanalysis, is $C_{27}H_{42}O$. This gives a molecular weight of 382, while the molecular weight as found by the depression of the freezing point of the compound was 370. The compound does not form an insoluble digitonide. Attempts at esterification have been partially successful, suggesting that the compound contains an alcoholic hydroxyl group.

Evidence along various lines is given leading to the tentative conclusion that the "crystals are composed of one substance showing high dextrorotation and antirachitic activity, mixed with a small quantity (perhaps 5 to 10 per cent) of a second product of lower or opposite rotation. Further, . . . if this second product also has antirachitic activity, it is not intensely active, and is only responsible for a small part of the activity of the whole crystals."

Since the substance or substances normally produced by the irradiation of ergosterol differ in various properties from the purified compound, it is concluded that "if the crystals are essentially a single antirachitic compound (with only unimportant impurities), there must exist not less than two substances possessing intense antirachitic activity."

**Some of the characteristics of yeasts found in fermenting honey, G. E. Marvin, W. H. Peterson, E. B. Fred, and H. F. Wilson** (*Jour. Agr. Research [U. S.], 43 (1931), No. 2, pp. 121–131, pls. 2*).—This contribution from the Wisconsin Experiment Station reports the results of a study of yeasts isolated from fermenting honey. It is shown that when honey granulates, the water serving as a solvent for the glucose is retained in the liquid part of the honey and increases the moisture content of the sirup. Crystallization is thus equivalent to diluting the uncrystallized honey with water, the sirup becoming dilute enough to permit the growth of yeasts that could not grow in the unchanged honey.

"The fermentation process in honey is slow, extending over a period of six months to several years. About equal quantities of carbon dioxide and alcohol (rarely over 5 per cent), together with small amounts of nonvolatile acids, form the chief fermentation products.

"Some of the yeasts isolated from fermenting honey correspond with previously described species. What appear to be two new species are described. . . . Fermentation of honey can be prevented by heating the honey to 160° F., pailing it while hot, and cooling it immediately. Honey in storage will not ferment if kept at temperatures below 52°."

**On the decomposition of hemicelluloses by microörganisms, I–III, S. A. Waksman and R. A. Diehm** (*Soil Sci., 32 (1931), No. 2. pp. 73–95; 97–117, figs. 5; 119–139, figs. 2*).—The papers here noted form the first report upon a new series of studies of the New Jersey Experiment Stations.

I. *Nature, occurrence, preparation, and decomposition of hemicelluloses.*—This paper presents a detailed discussion of the chemistry of the hemicelluloses, of which our present knowledge is considered to be in a "confused state," the methods for the determination of these compounds, and their occurrence in nature, together with a general review of the decomposition undergone by hemicelluloses during the decomposition of plant materials in manure composts and in soil. An extensive reference list is appended.

II. *Decomposition of hemicelluloses by fungi and Actinomyces.*—The second installment of the report takes up the decomposition, both in the purified form and in the natural plant materials containing them, of mannan, xylan, and galactan, by pure cultures of fungi and Actinomyces.

"All the fungi tested were able to decompose the specific hemicelluloses; the Phycomycetes were as active in this process as the cellulose-decomposing fungi used." The Actinomyces were found even more active in the decomposition of hemicelluloses than the fungi, especially under favorable culture conditions.

When the rate of decomposition of hemicellulose by microorganisms was compared, by measuring the evolution of carbon dioxide, the fungi were found to be more active in the beginning of the incubation period, but became considerably slower after decomposition had proceeded for about a week. The Actinomyces were slow at the beginning of incubation, but maintained a more uniform rate of decomposition throughout a longer period of time.

"The type of hemicellulose was found to be the most important determining factor in controlling the actual amount of decomposition by fungi. The Actinomyces, however, were influenced not only by the type of hemicellulose but also by the environmental conditions at which decomposition was taking place. Both fungi and Actinomyces liberate considerable amounts of carbon dioxide in the process of destruction of hemicelluloses. The former also produces small amounts of organic acids in this process. It appears that the process of preparation and purification of the hemicelluloses influences the nature and rate of their decomposition by microorganisms."

III. *Decomposition of various hemicelluloses by aerobic and anaerobic bacteria.*—This part of the report is concerned with the decompositions of hemicelluloses affected by aerobic and anaerobic bacteria. Many aerobes decomposed the hemicelluloses studied, but the decompositions observed varied both in nature and in extent.

"Galactan was found to be more resistant to decomposition by aerobic bacteria than mannan and xylan. In the case of aerobic bacteria, both the nature of the hemicellulose and the environmental conditions influenced markedly the quantities of hemicellulose decomposed. Chemical purification appears to render hemicelluloses more resistant to decomposition. This is especially true of the anaerobic bacteria. Organic acids were produced both by aerobic and anaerobic bacteria in the decomposition of hemicelluloses. The anaerobic bacteria produced different gases in the decomposition of the hemicelluloses."

The three papers are followed by a general summary.

**The microscopic examination of cattle foods**, S. T. PARKINSON and W. L. FIELDING (*Ashford, Eng.: Headley Bros., 1930, pp. VIII+97, pls. 15, figs. 9*).—This treatise was prepared to assist food analysts in identifying the contents of mixed feeds by microscopic examination. Photographs illustrate the appearance of the fragments of various foods in the mixed product. The subject matter is divided into the following parts: Oil-containing plants, cereals, leguminous plants, and miscellaneous constituents found in cattle foods.

## METEOROLOGY

**Snow-melting characteristics**, G. D. CLYDE (*Utah Sta. Bul. 231 (1931), pp. 48, figs. 18*).—This bulletin summarizes the results of several years of study to determine the factors which affect snow-melting characteristics and the relationship of these characteristics to run-off and watershed losses. It has been found that the rate of melting from high watersheds is an important factor in the total run-off as well as in its distribution. It appears that the net yield of water from a watershed is equal to the total precipitation on the watershed minus the losses, and that losses are a direct function of the snow-melting characteristics.

The field studies showed that the density of the snow cover increased to a maximum of 49.4 per cent and then decreased to about 37 per cent, where it remained during the rest of the melting period. While a rapid decrease in temperature causes a decrease in melting, the accumulated water in the snow continues to drain out even after the temperature decreases. Before melting begins the density of a snow column is not uniform, but after it begins the density becomes uniform throughout its depth, except for the zone of capillary storage. The major portion of the early melting appears to take place at the snow surface. It was found that a depth measurement of the snow cover is not a reliable indicator of its water content as the depth may diminish, due to melting, evaporation, or increase in density. Snow does not melt at the same rate that water drains out of it.

Field and laboratory measurements showed that water drains from snow at a uniform rate throughout the melting period. In spite of this a marked fluctuation in stream discharge was found. due to temperature changes. It appears that while temperature materially affects the rate of melting it has little effect on the rate of drainage, unless long periods of low temperature occur.

Laboratory studies showed that snow melts from the surface as well as from the bottom, and the water passes down through the snow, following irregular but well-defined paths. The lag between beginning of melting and the appearance of run-off varies widely but seems to increase with the initial density of the snow. Snow increases in density as melting progresses, the increase being more rapid in snow having a low initial density. A cold backward spring which causes slow melting induces a lower but a better distributed run-off. The opposite condition is caused by a warm early spring. Snow-melting characteristics govern the losses to a large extent, rapid melting reducing the losses and slow melting increasing the losses.

**Climatological data for the United States by sections, [March–May, 1931]** (*U. S. Dept. Agr., Weather Bur. Climat. Data, 18 (1931), Nos. 3, pp.* [217], *pls. 4, figs. 3; 4, pp.* [206], *pls. 3, figs. 4; 5, pp.* [200], *pls. 3, figs. 4*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for March, April, and May, 1931.

**Meteorological records, Sandpoint, Idaho, 1910–1930**, compiled by J. H. Christ (*Idaho Sta. Circ. 64 (1931), pp. 16*).—Observations on temperature. total precipitation, snowfall, cloudiness, and frost, made in cooperation with the U. S. D. A. Weather Bureau, are summarized in tables.

The average annual precipitation for the 20 years 1910–1930 was 27.23 in., varying from 17.93 in. in 1929 to 42 in. in 1927. The average annual snowfall for the period was 71.3 in., varying from 26 in. in 1929–30 to 192.5 in. in 1915–16. The average mean annual temperature was 56.9° F., the extreme range for the period being from 104° July 20, 1923, to −28° January 21, 1927. The average growing period free from killing frosts was 117 days, varying from 85 days in 1925 to 155 days in 1927. The longest drought period recorded was 43 days, July 2 to August 15, 1921. The average number of clear days a year for the period was 149.

## SOILS—FERTILIZERS

**A handbook of soil science, III–VIII**, edited by E. Blanck (*Handbuch der Bodenlehre. Berlin: Julius Springer, 1930, vols. 3, pp. VIII+550, pls. 3, figs. 61; 4. pp. VIII+334, figs. 32; 5, pp. VII+483, figs. 103; 6, pp. VII+423, figs. 104; 1931, vols. 7, pp. VII+473, figs. 72; 8, pp. VIII+714, figs. 21*).—The first section of this work, already noted in part (E. S. R., 65, p. 714), is completed by volumes 3 to 7. Volume 8, applied or special soil science, opens section 2. Of these volumes, volume 3 deals with weathering in relation to external climatic factors; volume 4 with weathering and soil formation as dependent upon the geological subsoil and other natural factors, and surfaces of weathered fossil material, and volume 5 with the soil as the uppermost layer of the earth's surface. Volumes 6 and 7 constitute part 2 of the first section of the work, dealing with the soil as a substratum, its nature and properties, volume 6 taking up the mechanical make-up of the soil and the phenomena dependent thereon and volume 7, the chemical and geological nature of the soil. Volume 8 discusses cultivated soils, their characteristics and classification from the agricultural viewpoint, and the determination of the condition of the soil with respect to fertility.

**[Soil Survey Reports, 1927 Series]** (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1927, Nos. 14, pp. 35, pl. 1, fig. 1, map 1; 15, pp. 48, pl. 1, fig. 1, map 1; 16, pp. 22, pls. 2, fig. 1, map 1; 19, pp. 32, pls. 2, fig. 1, map 1*).—The four survey reports here noted were prepared with the respective cooperation of the Iowa and California Experiment Stations, the Idaho College of Agriculture and Experiment Station, and the Mississippi Geological Survey.

No. 14. *Soil survey of Union County, Iowa*, J. A. Elwell and W. J. Moran.—Union County, southeastern Iowa, includes 273,280 acres of gently rolling to rolling lands having "a network of drainage ways which reach every quarter section of land in the county." The soils mapped are classified as 12 series of 16 types, the more prominent in areal extent being Shelby loam, covering 44.6 per cent of the total area, Muscatine silt loam, which occupies 24.3 per cent, and Grundy silt loam, amounting to 11.3 per cent.

No. 15. *Soil survey of the Santa Ynez area, California*, E. J. Carpenter et al.—The Santa Ynez area, a part of Santa Barbara County, southwestern California, contains 482,560 acres, and is characterized by surface features which vary widely. Drainage, of which the Santa Ynez River is the principal outlet, is, in the greater part of the area, well developed.

Aside from 38.2 per cent of rough broken land and 3.4 per cent of other unclassified material, agricultural soils reaching a total number of 19 series of 36 types were found, the most abundant being 6.4 per cent of Marina sand.

No. 16. *Soil survey of the Jerome area, Idaho*, E. N. Poulson and J. A. Thompson.—The Jerome area, a generally somewhat rolling tract of 173,440 acres in southern Idaho, "occupies a well-drained upland region" and includes the irrigated agricultural land of Jerome County.

Three soil series inclusive of 8 types, together with 32.4 per cent of scab land and 1.5 per cent of rough stony land, are listed, the most important areas being those of Portneuf silt loam, amounting to 37.1 per cent of the total area surveyed, and Portneuf fine sandy loam, 11.6 per cent. Data showing the moisture equivalents of the various soils are tabulated.

No. 19. *Soil survey of Jackson County, Mississippi*, J. A. Elwell et al.—Jackson County has an area of 463,360 acres in southeastern Mississippi, the southern half flat in surface and in large measure inadequately to very poorly drained and the northern half more rolling.

Soils of 18 series were found and are classified as 30 types. Norfolk fine sandy loam constitutes 18.6 per cent of the area, and Plummer fine sandy loam, included among the "soils most typical of the poorly drained soil groups," takes up 11.2 per cent. In addition to large sections rendered nonagricultural by lack of drainage the survey reveals 8.7 per cent of tidal marsh and 3.6 per cent of muck, dune sand, and beach sand.

**[Soil Survey Reports, 1928 Series]** (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 4, pp. 22, fig. 1, map 1; 5, pp. 48, fig. 1, map 1; 6, pp. 22, fig. 1, map 1; 7, pp. 37, fig. 1, map 1*).—The reports of this group were prepared with the cooperation of the Arizona (Nos. 4 and 6), Iowa, and South Carolina Experiment Stations, respectively.

No. 4. *Soil survey of the Gila Bend area, Arizona*, F. O. Youngs et al.—The Gila Bend area of 148,360 acres in southwestern Arizona forms a part of Maricopa County, and has a surface relief "characterized by small isolated ranges of low but rugged mountains, consisting largely of bare rock, and much larger surrounding areas of valley lands." The greater part of the area is well drained.

Of the 14 soil types, representative of 5 series, mapped and described, Laveen sandy loam, covering 16.0 per cent of the total tract surveyed, Laveen gravelly sandy loam 14.2 per cent, and Gila fine sandy loam 11.7 per cent, constitute the soils of important areal extent. The unclassified material consists of 9.8 per cent of river wash, rough stony land to the extent of 5.4 per cent, and 0.4 per cent of scab land.

Irrigation, drainage, and alkali problems are discussed.

No. 5. *Soil survey of Butler County, Iowa*, J. A. Elwell and E. N. Poulson.—Butler County, northeastern Iowa, covers an area of 371,840 acres, for the most part an undulating plain presenting an extensively ramified drainage system. The soils examined are mapped and described as 16 series represented by 28 types, together with 3.2 per cent of meadow, and 0.1 per cent of muck and peat. Carrington silt loam predominates in aggregate extent, with a total area of 31.0 per cent of the entire county, while Clyde silt loam occupies a further 16.0 per cent.

No. 6. *Soil survey of the Paradise-Verde area, Arizona*, F. O. Youngs et al.—The Paradise-Verde area, south-central Arizona, is a tract of 133,760 acres consisting of "scattered groups of low rocky barren mountains or hills and large fairly level valleys." Drainage was found to be good.

The soils mapped and described in the Paradise-Verde area were classified in 5 series inclusive of 14 types, with 1.7 per cent of river wash and 13 per cent rough stony land. The more important areas are those of Mohave loam, 19.1 per cent, Mohave sandy loam, 17.0 per cent, and Pinal stony sandy loam, 10.2 per cent.

No. 7. *Soil survey of Williamsburg County, South Carolina*, W. J. Latimer et al.—Williamsburg County consists of 627,840 acres of "flatwoods" lands, of which 75 per cent are from imperfectly to poorly drained.

This report lists 36 soil types assigned to 17 series, Coxville fine sandy loam, of which the "surface drainage is naturally poor, and internal drainage is slow," constituting 16.2 per cent of the county. Johnston loam, which "occurs as swamp land . . . occupying overflow areas along most of the smaller streams in all parts of the county," follows with 13.8 per cent. Norfolk fine sandy loam and Dunbar fine sandy loam take up 10.7 and 10.6 per cent, respectively.

Recommendations for the improvement of these soils are included.

**Studies in soil colloids, I–V**, A. N. PURI (*India Dept. Agr. Mem., Chem. Ser., 11 (1930), Nos. 1, pp. 1–38, figs. 10; 2, pp. 39–51, fig. 1; 6, pp. 101–118, figs. 6; 7, pp. 119–131, figs. 2; 8, pp. 133–141*).—The five papers here noted cover phases of the chemical and physicochemical behavior of soil colloids, their determination as a whole in soils, and the measurement of certain of their physical and chemical properties.

I. *Base exchange and soil acidity*.—"A number of reactions characteristic of soluble acids were studied in fully unsaturated soils obtained by exhaustive treatment with N/20 HCl. The outstanding facts . . . are that acidoids, though insoluble, show reactions similar to those of soluble acids. These, however, take place in three distinct stages in which one, two, or three equivalents of H can take part, i. e., $H_1$, $H_2$, and $H_3$.

"The experimental facts adduced so far can be best interpreted by supposing that the acidoid in a fully unsaturated soil is a tribasic acid.

"The results of liming experiments on a 2-acre plat carried out at Dacca (Bengal) show that toxicity of acid soils is confined to $H_1$ only, for the measurement of which a simple method is outlined."

II. *Factors influencing the dispersion of soil colloids in water.*—Factors influencing the dispersion of soil colloids in water were studied with particular reference to the nature of the exchangeable ion.

The nearest approach to the state of aggregation as it exists in the field was obtained when a soil was left in contact with water for 24 hours, the clay (0.002 mm.) determined by the pipette method, and the value thus obtained designated as the dispersion factor (*D. F.*).

Dispersion coefficient (*D. C.*) is defined as the percentage of the total clay that can pass into suspension by "auto-subdivision" on being left in contact with water for 24 hours, i. e., $D.\ C. = \frac{D.\ F. \times 100}{\text{Clay content}}$

"Dispersion coefficient can be used for comparing the state of aggregation of particles in different soils and in general shows a positive correlation with the degree of alkalization in a given soil. All barren alkali soils, rich in exchangeable Na, studied, had a dispersion coefficient above 50 per cent. Successful treatment of an alkali soil with gypsum results in a substantial lowering of the dispersion coefficient, and where the response is poor, the change in this value is slight."

III. *Flocculation of soil colloids.*—Flocculation of clay suspensions was investigated, with reference especially to the nature of the exchangeable ion in soil colloids. The nature of the replaceable base in a soil appeared to have a profound influence on the flocculation values for different ions. "Of special interest are the results with soils containing increasing amounts of exchangeable sodium in them; which show that as sodium increases, the flocculation value for calcium ions increases correspondingly." The importance of these results in the practical reclamation of alkali soils is pointed out.

IV. *Methods of estimating soil colloids.*—Methods of determining soil colloids are briefly reviewed. It appeared that a number of such methods are affected by the nature of the exchangeable base in the soil and thus are not applicable to the purpose for which they were intended.

"It is suggested that hygroscopicity of a soil should be measured by bringing it into equilibrium with an atmosphere of 70 per cent humidity; and soil in equilibrium with an atmosphere of 10 per cent humidity should be considered as dry basis for referring to hygroscopic moisture."

V. *Methods of determining saturation capacity and degree of saturation of soils.*—Methods of determining saturation capacity and degree of saturation of soil colloids were critically examined, and a new method of finding the state of saturation of soils with respect to bases is outlined, as follows:

To 10 gm. of the soil add 100 cc. of water and shake for about 2 hours with 2 gm. of $CaSO_4$. Run in 100 cc. of N/5 $Ba(OH)_2$ and shake the mixture for about 6 hours during 2 days. Add 10 drops of phenolphthalein solution and run in N/10 $H_2SO_4$ till the color of the supernatant liquid is discharged. Then add the acid gradually, shaking the suspension vigorously after each addition. "The titration is complete when absolutely colorless supernatant liquid is obtained on leaving the suspension for a couple of hours. At first the pink color slowly reappears when more N/10 $H_2SO_4$ is added. The titration is completed in about 2 to 3 days. The total baryta minus the total acid gives the amount of base retained by the soil and is equal to (*T—S*). (*T*) is determined by washing another 10 gm. of soil with N/20 hydrochloric acid till all the replaceable bases are removed (tested by the absence of Ca ions in the filtrate) followed by washing with water till the free acid is removed. The soil is then transferred to a bottle and back titrated after adding excess of $Ba(OH)_2$ exactly as described above. From the values of $T$ and $(T-S)$, $(S)$ is easily known when $V$ can be calculated by the formula $V=\frac{100S}{T}$.

"The method is very simple and rapid, as even 20 soils can be started all at once. The alkali or the acid is added to one, while the others are settling. The titration is carried out best in 500-cc. reagent bottles with rubber corks.

"It should be noted that in the method outlined above, although $Ba(OH)_2$ is used, the whole of it is converted into $Ca(OH)_2$; and the absorption of the base takes place in a saturated solution of lime and the neutralization of the latter is conducted in a saturated solution of $CaSO_4$."

**The effect of soil reaction on the growth of tomatoes and lettuce and on the nitrogen, phosphorus, and manganese content of the soil and plant,** E. M. Emmert (*Kentucky Sta. Bul. 314 (1931), pp. 83, figs. 19*).—Tomatoes and lettuce were grown in soil adjusted to different reactions, from pH 4.4 to 9.8, by the addition of phosphoric acid, sulfuric acid, nitric acid, calcium carbonate, calcium hyroxide, or sodium carbonate.

"Acidity between pH 4.3 and pH 5.3 increased the early yield of tomatoes, but the total yield was less than that of the checks. The data indicate that nitrate nitrogen was a limiting factor in these plats.

"Alkaline reaction increased the yield of tomatoes. With sodium carbonate to pH 8.3 to 8.5, the increase was very marked. It was not so marked with lime to the same reaction. Sodium carbonate to produce pH 7.2 to 8.6 increased the yield of lettuce greatly, but at pH 8.6 to 8.9 or with lime to pH 8.3 to 9.8, the yield was only slightly larger than that of the checks. Lime without organic matter caused poor growth and yellow foliage of both lettuce and tomatoes. The phosphate content of the plants was diminished.

"Acidity of pH 5.6 to 5.4 with phosphoric acid, or pH 6.5 to 6.0 with sulfuric acid, produced a marked increase in the yield of lettuce. Both tomatoes and lettuce exhibited exceptional vigor of growth on certain of the alkaline plats, especially where organic matter had been added. This is attributed to increased nitrification and azofication brought about by the alkali.

"Application of sodium carbonate and organic matter, perhaps supplemented by lime, offers a method of increasing soil fertility without the use of legumes and without the danger of precipitating certain elements as is the case when lime alone is used. When the acidity of the manganiferous bluegrass soil is made stronger than pH 6, by either phosphoric, nitric, or sulfuric acid, manganese is made soluble. The rapid increase of the quantity dissolved, with increased acidity, suggests that toxic concentration may easily be reached. Analysis for nutrient elements in the conducting tissue of a plant seems to afford better evidence of what the plant can obtain from the soil than analysis of the soil in which the plant is growing."

**Relative numbers of two species of Rhizobium in soils,** J. K. Wilson (*Jour. Agr. Research [U. S.], 43 (1931), No. 3, pp. 261-266*).—This contribution from the New York Cornell Experiment Station reports a further investigation (E. S. R., 64, p. 210), carried out by essentially the same methods, into the relative abundance of *R. trifolii* and *R. leguminosarum* in samples of the four soil types Dunkirk gravelly loam, Chenango gravelly loam, Wooster sandy loam, and Dunkirk silty clay loam, the numbers of each species having been observed in 44 samples. "The criterion by which the numbers of the two species were determined was nodule production, which was brought about from suspensions representing definite portions of soil. Since the numbers of *R. trifolii* and *R. leguminosarum* were determined not only in the same samples of soil but also in the same fraction of a gram a comparison of the two species was possible."

"Soils in general were found to support a larger number of *R. trifolii* than of *R. leguminosarum*. Forty-two of the 44 samples taken from four soil types showed this relationship. This difference in the capacity of soils to maintain the population of one organism at a higher level than that of another of the same genus does not seem to be related to soil reaction, to moisture content, or to seasonal variation. There were some indications that it might be associated with the type of inorganic salts present in the soil."

**[Soil and fertilizer tests at the Moses Fell Annex Farm, Bedford, Ind.]** (*Indiana Sta. Circ. 183* (*1931*), *pp. 4–8*).—This continues earlier work (E. S. R., 64, p. 121).

*General soil fertility test.*—It is stated that "the spread between the good and poor treatments is becoming greater year by year, and that the better treatments are becoming more and more profitable. Without soil treatment, the average value of the crops per rotation of corn, soybeans, wheat, and clover is now $29.90 per acre. With lime, manure, and phosphate, the value is $78.17, at an average cost of $8.05 for lime and phosphate."

*Comparison of different phosphates.*—"The largest returns have been secured from the combination of ground limestone, manure, and medium to heavy applications of superphosphate. . . . In combination with lime and manure, superphosphate has been the most profitable source of phosphorus." On the other hand, "on manured land without lime, rock phosphate and superphosphate have been about equally profitable," although "it pays better on this land to use lime and superphosphate instead of rock phosphate"; and further, "without manure, rock phosphate alone has produced larger returns than the combination of lime and superphosphate, although in both cases the crop yields have been too low to be profitable."

**[Soil fertility studies of the New Hampshire Station]** (*New Hampshire Sta. Bul. 256* (*1931*), *pp. 13, 14, fig. 1*).—The long-period fertility experiments last noted from Bulletin 250 (E. S. R., 63, p. 209) were continued with 461 plats located at five different points in New Hampshire.

In the grass plats at Greenland, where the original sod plats, badly run out, were not plowed, nitrate of soda did not give as significant an increase as it did on the plowed sections, whether manured or not. Superphosphates, when used alone, did not give a significant increase. Lime, both in 2- and 4-ton applications, showed significant yields.

"In the potato plats at Colebrook phosphorus has proved thus far a sensitive element. Leaving it out of the formula depressed the yield 85 bu. per acre, while doubling it over the regular 5–8–7 formula increased the yield 50 bu. per acre. More response was obtained for varying the potash than in the previous year. Leaving potash out of the formula depressed the yield 115 bu. per acre, and, where lime was introduced, 178 bu. Increasing the potash from 7 to 10 per cent increased the yield 32 bu. Varying the nitrogen does not appear to have so much influence. Judging by the average yields of the potatoes in the first two years of this experiment, much better returns might be expected from 1 ton of a 5–16–10 fertilizer than from 1.5 tons of a 5–8–7."

**The fertilizing value of greensand,** G. S. Fraps (*Texas Sta. Bul. 428* (*1931*), *pp. 25*).—Pot tests were run in three soils in an attempt to determine the availability of the phosphorus and potassium of greensand. The availability was measured by the quantities of phosphoric acid and potash removed by corn or kafir, from several samples of greensand, in excess of the quantity removed from the soils compared with the amounts of potash removed from muriate or sulfate of potash or the phosphoric acid removed from superphosphate under the same conditions.

"The maximum availability of the phosphoric acid in greensand was 40 per cent of that of superphosphate, while the minimum was zero. The maximum availability of the potash of greensand compared with that of potash salts was 12 per cent. A liberal average availability was 10 per cent for phosphoric acid and 8 per cent for potash in greensand." The Texas greensand was not shown to "contain sufficient fertilizing value to justify attempting to sell it as a commercial fertilizer."

**Limestone, the key to soil building and higher crop yields,** C. M. Linsley (*Illinois Sta. Circ. 375 (1931), pp. 32, figs. 22*).—This popular statement gives the following four steps for soil building:

"(1) Test for acidity and apply limestone where needed. (2) Grow clovers on at least a fourth of the crop land. They will put life into the soil by supplying nitrogen and active organic matter. (3) Test for available phosphorus and apply phosphate where the supply is deficient. Phosphorus will increase hay and grain yields and improve the quality of the grain. (4) On peat and alkali soils apply potash. On other soils, especially the light-colored soils of southern Illinois, try out potash on a small area of corn."

**Moss peat, its uses and distribution in the United States,** A. P. Dachnowski-Stokes (*U. S. Dept. Agr. Circ. 167 (1931), pp. 12, figs. 6*).—The author considers especially the imports of moss peat, its characteristic properties, its use, the general requirements for a successful moss-peat industry, and the distribution of domestic deposits.

On the last-named sources, "for the development of a moss-peat industry on a large scale, the dome-shaped heaths in Washington County, Me., appear to offer superior advantages. They resemble European 'high moors' in having a raised surface layer of moss peat ranging from 5 to 8 ft. in thickness and in being located near the coast, with facilities for shipment" by water.

"Inasmuch as the importation of moss peat during the last few years amounts to nearly $2,000,000 in value and its consumption in this country is continually growing, the desirability of a systematic investigation of American peat resources and their possibilities for uses other than farming is very evident."

**Commercial fertilizers,** H. R. Kraybill et al. (*Indiana Sta. Circ. 182 (1931), pp. 76, figs. 2*).—The usual analytical data are reported for 1930, accompanied by the A. O. A. C. definitions of fertilizers and fertilizer materials and other related information.

**Analyses of commercial fertilizers, season 1930–1931,** R. N. Brackett and D. H. Henry (*South Carolina Sta. Bul. 276 (1931), pp. 55*).—The usual analyses and related data are reported.

## AGRICULTURAL BOTANY

**Principles of plant physiology,** O. Raber (*New York: Macmillan Co., 1928, pp. XIII+377, pls. 10, figs. 29*).—"This book, which has grown out of a series of lectures given at the University of Wisconsin and later at the University of Arizona, is planned to meet the need for a new presentation."

**Physiological characteristics of races and varieties of cultivated plants.—I, Cardinal points of soil moisture for the development of three wheat varieties** [trans. title], A. A. Kuz'menko (Kuzmenko) (*Izv. Glav. Bot. Sada S. S. S. R. (Bul. Jard. Bot. Princ. U. R. S. S.), 27 (1928), No. 4, pp. 387–419, figs. 9; Ger. abs., pp. 416–419*).—The purpose of this investigation was to study the hereditary physiological characters of summer wheat varieties in relation to the principal growth factors, as soil moisture, temperature, soil elements, nitrogen, and illumination, in order to establish reliable physiological grounds for diagnosis on a quantitative basis and so have at hand physiological characters of each kind, along with morphological characters for the purpose of varietal designation. A number of such varietal characters are indicated.

**Phytophysiological studies on alkaloids.—I, Nicotine in the metabolism of the tobacco plant** [trans. title], K. MOTHES (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 5 (1928), No. 4, pp. 563–615, figs. 3*).—This account deals with the distribution of alkaloid in the tobacco plant, its relations to growth, the influence of light on its formation, its chemical relations, its movements, inner causes of nicotine apportionment in the normal plant, and the relations between the reaction of the nutritive solution, nitrogen metabolism, and alkaloid formation. Data and inferences are discussed in some detail.

**Metabolism in variegated plants** [trans. title]. W. SCHUMACHER (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 5 (1928), No. 2, pp. 161–231, figs 3*).—Among the data detailed as resulting from the present study, it is stated that among the conditions characterizing the metabolism in variegated plants is noted a lessening of total nitrogen with an increase of soluble nitrogen content in the white tissue, which later becomes notable along with amino acids, but particularly with amides. The white tissue is poorer in carbohydrate than are the green parts. The cause of variegation is not to be found in starvation. White tissue respires less, contains more peroxidases, and shows less catalase.

An account is given of the process of greening and its relation to temperature.

**The influence of phytosocial relations on the course of the struggle for existence between cultivated plants and weeds** [trans. title], E. A. SMIRNOVA (*Izv. Glav. Bot. Sada S. S. S. R. (Bul. Jard. Bot. Princ. U. R. S. S.), 27 (1928), No. 2, pp. 161–187, figs. 2; Ger. abs., pp. 186, 187*).—The author details the results obtained from a study made on the effects of thick plantings, both of pure and of mixed forms, on the progress of the struggle for existence, during 1925 on *Linum usitatissimum* and *Camelina sativa* and during 1926 on *L. usitatissimum* and *Agrostemma githago*. All three plants were found to be quite resistant to crowding.

**The expressed sap of corn plants as an indicator of nutrient needs,** N. A. PETTINGER (*Jour. Agr. Research [U. S.], 43 (1931), No. 2, pp. 95–119, pl. 1, figs. 4*).—Using sap extracted under a pressure of 6,500 lbs. per square inch from the basal 15 in. sections of cornstalks, the author, working at the Virginia Experiment Station, found a general relationship between the color of the sap and the productiveness of the soil upon which the corn was grown. Saps colorless after clarification and those light brown in color indicated a fertile soil, while dark brown color was associated with unproductiveness. Sap color was closely correlated with potash fertilization. The potash content of the sap showed nearly perfect correlation with the potash fertilization. There was a slight tendency for potash to increase in the sap during September. The concentration of nitrate nitrogen showed only a moderate correlation with nitrogen fertilization, but was closely associated with the soil supply of nitrate nitrogen. Total phosphorus content of the sap was closely related to the phosphorus supplied the soil and to the availability of the form used. Phosphorus concentration was high when grain production was subnormal and lower when grain production was normal or above. Phosphorus accumulated in the sap in September after the ears had developed.

Sap extracted from plants growing in very deficient soils had less than 100 parts per million of nitrate nitrogen, less than 0.1 mg. of phosphoric acid per cubic centimeter of sap, and less than 1 mg. of potassium oxide per cubic centimeter.

The H-ion concentration of the expressed sap was correlated with potash fertilization. Saps from plants grown on plats receiving potash were generally below pH 5.45, while those of plants receiving no potash were higher. However, H-ion concentration was not appreciably correlated with soil productivity.

The color of the corn plant proved a good index to nitrogen needs, agreeing with the results of the Hoffer stalk test for nitrates and with the sap test. Dead tissue around the margins and between the veins of the leaves was found an indication of potash deficiency. The amount and severity of lodging was found a guide to potash needs, since applications of potash were accompanied by better root anchorage, a result believed due to the prevention of iron accumulations at the nodes and interference with food translocation to the roots.

**Effect of mineral nutrients upon seed plants.—II, Phosphates,** T. W. Turner (*Bot. Gaz., 88 (1929), No. 1, pp. 85–95; abs. in Amer. Jour. Bot., 15 (1928), No. 10, p. 617*).—Work published in 1922[1] began a series of experiments regarding the effects of certain mineral nutrients on plants, dealing principally with the effects of nitrates. The present article continues the series in dealing with the effects of phosphates in relation with barley, wheat, cotton, and corn.

The water culture experimentation with these crops is held to show that in the case of each the ratio of top growth to root growth decreases as the phosphate concentration increases, as though the phosphate retarded top growth or stimulated root growth. The three series of experiments with corn consistently indicate that increase in phosphorus concentration retards growth in length of roots and also decreases the multiplication of lateral roots. Cellular activity, which should manifest itself through increased growth in length or in multiplication of secondary roots, is not increased by direct application of phosphates as implied in statements frequently made. "The actual fact noted, therefore, that there is a decreasing ratio of tops to roots as the phosphate concentration is increased, must find explanation in the formation of compounds or simple substances in connection with photosynthetic activity in the tops, which are translocated to the roots and manifest themselves there by their growth stimulating or storage effects."

**The relation of season of wounding and shellacking to callus formation in tree wounds,** R. P. Marshall (*U. S. Dept. Agr., Tech. Bul. 246 (1931), pp. 29, figs. 25*).—In studies conducted in the Yale Forest Preserve, Woodbridge, Conn., observations were made on the healing of auger holes bored at monthly intervals throughout the year in five trees each of red maple, tulip, and white, red, chestnut, and black oaks. Two wounds were made in each tree at each date, one being shellacked and the other untreated. Wounds made February 15 to May 15 developed the most desirable and abundant callus in all six species. Shellac aided callus formation in all species except the tulip, with some evidence that the effect may vary according to the season applied. The condition of the tree was a prime factor in healing, callus formation being much more rapid in vigorous than in weak trees.

**Cuticular transpiration** [trans. title], Saribek-Agamov (*Izv. Glav. Bot. Sada S. S. S. R. (Bul. Jard. Bot. Princ. U. R. S. S.), 26 (1927), No. 6, pp. 576–594; Ger. abs., pp. 593, 594*).—Methods, figures, analyses, and discussion are given in connection with work done in the summer of 1926 under N. A. Maksimov at Leningrad with 35 plant species.

Thickness and degree of permeability of the cuticle, which in the stomatal transpiration of water-impregnated plants have no great significance, appear as extremely important protective factors in the case of plants wilting on account of excessive water loss.

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[1] Amer. Jour. Bot., 9 (1922), No. 8, pp. 415–445.

**The density of stomata in citrus leaves,** H. S. Reed and E. Hirano (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 3, pp. 209–222, figs. 9*).—Selecting leaves from shoots located on the south side of trees, the authors observed at the California Citrus Experiment Station that the stomata are produced during the early stages of development of the leaf and are confined to the ventral surface of the lamina. Stomata were found more abundant in lemon than in orange leaves. The density of the stomata varied in different parts of the leaf, with the intensity of the light, with the age of the leaf, and with the position of the leaf upon the shoot. The coefficient of correlation between the average size of mature lemon leaves and the density of the stomata was −0.307 ±0.004. The maximum growth in area of orange leaves was near the center of the lamina, the minimum near the apex. The size of the stomata seemed to be only slightly influenced by the number per unit area.

**About diurnal variations of the carbohydrates and their relation to the content of water in the leaves of higher plants** [trans. title], A. I͡A. Kokin (A. J. Kokin) (*Izv. Glav. Bot. Sada S. S. S. R.* (*Bul. Jard. Bot. Princ. U. R. S. S*), *27* (*1928*), *No. 3, pp. 239–273, figs. 10; Eng. abs., pp. 270, 271*).—The author presents results, with bibliography, of a study of the quantitative relations existing at different hours of the day between leaf carbohydrates and leaf water, involving the employment of Lorber's colorimetric micromethod and the use of *Panicum miliaceum*, *Zea mays*, *Triticum vulgare*, *Helianthus annuus*, *Acer negundo*, and *Robinia pseudacacia*.

The amounts of reducing sugars in the leaves of these plants showed little diurnal variation, the quantity often not exceeding 3 per cent, though Helianthus and Robinia attain to 4 per cent. The diurnal variations of starch, as given, are greater. The greatest variations are given by nonreducing sugars, which reach a maximum about noon to 2 o'clock. During night and early morning the starch does not entirely disappear from the leaves of the plants used. The diurnal carbohydrate variations reflect in some degree the rhythmic variations of photosynthesis.

**Some phases of plant development under Vitaglass,** W. E. Tottingham and J. G. Moore (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 2, pp. 133–163, figs. 13*).—At the Wisconsin Experiment Station, 12 species representing 4 families of economic importance were tested as to growth and composition when grown under Vitaglass. Certain species which do not possess winter-hardening characteristics were more subject to frost injury following early development under Vitaglass than under ordinary glass. In some of the species, seed production, root storage, and earliness of blooming were favored by Vitaglass.

The most consistent compositional change induced by Vitaglass was an increased percentage of lipids in the dry matter. In some cases an increased percentage of protein or of nonprotein, nonlipid nitrogen was recorded. Some of the effects obtained by growing plants under Vitaglass resembled those due to photoperiodism, but no common causal factors for the two results were apparent.

**Control equipment for the study of hardiness in crop plants,** G. L. Peltier (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 2, pp. 177–182, figs. 4*).—In this contribution from the Nebraska Experiment Station, a description is given of an outfit consisting of three rooms, one each for hardening, freezing, and storage. The hardening room consists of a double-walled greenhouse supplied with a cooling equipment which enables the maintenance of constant temperature even on warm days. In the freezing room, temperatures as low as −30° C. can be obtained and held.

**Useful plants of warm countries,** E. Prudhomme (*Plantes Utiles des Pays Chauds. Paris: Larose, 1929, 2. ed., rev. and enl., pp. 161, pls. 73*).—About 30 warm- or hot-region useful plants are dealt with.

**Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, January 1 to March 31, 1930** (*U. S. Dept. Agr., Inventory 102 (1931), pp. 111*).—The usual descriptive list is presented of a total of 4,155 lots of plants, cuttings, and seeds introduced into the United States for trial and experimental purposes.

## GENETICS

**[Inheritance in grain sorghums, corn, and cotton],** R. E. Karper, P. C. Mangelsdorf, W. R. Horlacher, D. T. Killough, and J. R. Quinby (*Texas Sta. Rpt. 1930, pp. 48–51, 52, 53, 54, 55, 56, 135*).—Three separate single gene mutations involving chlorophyll development were found occurring in three of eight pure lines of kafir. When the tall plants of a tall dominant mutation were grown they segregated in the next generation in a ratio of three extra tall to one normal, indicating that the gene change occurred only in ovule or pollen development. Determinations of the chromosome number of various sorts of *Andropogon sorghum* or closely related Andropogons were continued. *Sorghum versicolor*, a wild form, was found with only five groups of chromosomes in the pollen mother cells, which appeared to be tetrasomes rather than disomes and differed from the condition found previously in the common cultivated sorghum (haploid 10) and in the perennial sorghum, Johnson grass (20). Five pairs of chromosomes appeared to be the basic number of this polyploid series in sorghums. Multiple seeded spikelets were found to occur quite often in milo. The series of abnormal spikelets described in *A. sorghum* resembles similar series found by others in *Zea mays*. The two genera apparently have in common many genetic characters, particularly chlorophyll deficiency, and the vegetative characters are similar. Homology of these abnormal spikelets in both sorghum and corn further evidences the close relationship.

White seedlings found, apparently the most frequent type of chlorophyll mutation in sorghums, were inherited as simple Mendelian recessives. Virescent seedlings, virescent white $v_1$ and virescent yellow $v_2$, were both simple recessives. One type of yellow seedling found in Sudan grass and one in kafir, of different phenotypic expression, were assigned different genetic factors, $y_1$ and $y_2$. Both were simple in inheritance and lethal in effect. White seedlings in Sudan grass gave ratios indicating as many as three pairs of multiple factors involved, although an albino factor acting as a zygotic or gametic lethal probably is a better explanation of the ratios obtained. A virescent yellow Sudan grass, in which the homozygous recessive survives to maturity, seemed due to a single gene. A chlorophyll deficiency in sorghum, strictly maternal in inheritance, produced normal, yellow, and striped green and yellow seedlings, depending upon the nature of the somatic tissue bearing the seed. The factors *R* for red stem and *W* for albino were found linked with a crossing over of 41.34 per cent. From studies at Chillicothe red seed coat, glume color, and pithiness of stalk appeared to be inherited independently in sorghum. A linkage between genes for glume color and the development of a nucellar layer was indicated with about 27 per cent crossing over. A selection from a feterita × kafir back-cross on feterita, designated as F. C. 6620, promised consistent yields under unfavorable conditions and bountiful yields under favorable conditions and was characterized by earliness, large leaf area and number, dwarfness, and white seeds that did not shatter.

The genetic factor or factors responsible for high sugary condition in corn were observed to be linked with a gene for sugary with a small percentage of crossing over. A new character resembling sugary endosperm appeared the result of duplicate factors and to occur often in ratios of 15:1. One gene involved apparently is allelomorphic to the sugary gene, while the other is linked with one factor for aleurone color. Hybrids of ordinary open-pollinated corn varieties again proved superior to the parents. Two sweet corn varieties resembling Mexican June and Surcropper, in preliminary tests, proved far superior to ordinary sweet corn in productiveness and in freedom from ear worm damage, the latter being due to a superior husk covering.

When corn (diploid 20) was crossed with the Tripsacum of Texas (diploid 36), the hybrid seedlings showed 28 chromosomes in the root tips, while hybrids with Tripsacum from Connecticut (diploid 72) showed 46 chromosomes in root tips. The developing endosperm of the crossed seeds was also a hybrid; cells of the endosperm of corn × Texas Tripsacum contained 38 chromosomes, the number expected if two corn endosperm nuclei fuse with the Tripsacum pollen nucleus. The one hybrid seedling surviving was intermediate, resembling Tripsacum somewhat more than corn. Both annual teosinte and perennial teosinte were forced into bloom during June, when corn was blooming, by giving the plants only 10 hours of light daily for about 4 weeks.

When seeds of a virescent yellow strain of cotton were irradiated (X-ray) at different dosages and then grown in the greenhouse, it was found that cottonseed could withstand a very heavy dosage of X-rays. While 100 kilovolts 5 milliamperes applied for 1 hour at a distance of 17 cm. did not decrease germination, the heavier treatment produced many dwarfed individuals. When transplanted to the field these plants developed as dwarfs, the extra dwarfs attaining a height of only 6 to 8 in. The many chimeras produced in the leaves indicated somatic changes which were probably due in some cases to gene mutations and in others to chromosomal aberrations. Six plants from the okra leaf X-rayed line developed leaves intermediate in shape between okra leaf and normal leaf. This intermediate shape is typical for the heterozygous condition and indicative that one of the genes for okra leaf was changed to the gene for normal leaf.

**Genetics of oats** [trans. title], H. Emme (*Züchter, 3 (1931), No. 4, pp. 109–124*).—This review of literature embraces 213 titles concerned with the inheritance of characters, hybrids, and natural hybridization, and mutations in oats.

**Genetic tests for linkage between row number genes and certain qualitative genes in maize,** E. W. Lindstrom (*Iowa Sta. Research Bul. 142 (1931), pp. 249–288*).—Extensive tests to determine whether the multiple genes for kernel row number on the corn ear would show genetic linkage with known genes on several of the corn chromosomes were made with linkage groups involving *P* (pericarp and cob), *R* (aleurone), *Su* (endosperm), and *Y* (endosperm color) chromosomes. A preliminary survey (E. S. R., 64, p. 428) had furnished some evidence that such linkages occur.

In a large series of crosses a very significant correlation was discovered between cob (and pericarp) color and row number which was so pronounced as to suggest that one of the major row number genes is located on the *P* chromosome. Tests involving aleurone color (*C* and *R*) and row number provided some evidence of correlation, particularly when *R* was involved with row number. While the correlation or linkage was intangible in some crosses, most of the data indicated that a row number gene was also to be found on the *R* chromosome. In tests of the *Su* chromosome for the existence of still another row number gene, certain crosses exhibited all the phenomena of genetic linkage between this endosperm character and row number. However, the exceptions made doubtful the existence of such a simple relationship as an ordinary linkage; indeed several cases of distinct reversal of linkage—parental classes occurring less frequently than nonparental—were noted. There was some evidence of genetic linkage between *Yy* endosperm color and row number, although the intensity of this linkage must be relatively low.

Conclusions from the studies were that the inheritance of row number is relatively complex, that the phenotype of row number is not always an indication of its true genotype even aside from environmental influence, and that the detection of genes for row number on the various chromosomes of corn is exceedingly difficult.

**The inheritance of colour, size and form of seeds, and of flower colour in Vicia faba L.**, A. G. Erith (*Genetica [The Hague], 12 (1930), No. 4–5, pp. 477–510, figs. 11*).—Ten varieties of *V. faba* differing in flower color, height of stem, and in color, size, and form of seeds were crossed and the inheritance of these characters investigated at the University of Reading.

Normal flower color was dominant to white and normal height to dwarfness, both with 3 : 1 $F_2$ segregation. In color of seed buff was dominant to purple, apparently depending on three factors, and also dominant to green. In crosses between a variety with brownish black seeds and buff-seeded beans the dark color was incompletely dominant, the segregation in $F_2$ being in ratios of 3 : 1 and 5 : 1. The dark brown or speckled seed of *V. faba pliniana* was dominant to pale seeded sorts, with 2 : 1 $F_2$ segregations. The characteristically large funicle of *V. faba pliniana* seeds appeared on all seed in $F_1$ and $F_2$. Black color of hilum was dominant to white with 3 : 1 $F_2$ segregation.

Segregation of size of seed was not sharply defined in $F_2$, indication being that seed size depends on several cumulative factors. Where the seeds of the parents differed widely in size, the average size of $F_1$ seed and the mean of $F_2$ were closer to the average of the small seeded parent. Where seed size differences between parents were small, $F_1$ seed averaged nearer the large seeded parent in size, and the mean seed size of $F_2$ was intermediate between the averages of the two grandparents. In inheritance, form of seed behaved similarly to size of seed, appearing to depend on several cumulative factors.

**Hybridization between Old World and New World cotton species and the chromosome behavior of the pollen mother-cells in the $F_1$-hybrid**, S. Nakatomi (*Japan. Jour. Bot., 5 (1931), No. 4, pp. 371–383, pls. 2, figs. 7*).—The crosses *Gossypium hirsutum* (26 haploid) × *G. herbaceum* (13) and Ashmouni Egyptian (26) × *G. herbaceum* produced at the Kwantung, south Manchuria, Experimental Station, gave rise to $F_1$ plants characterized by vigor and perfect sterility either with selfing or back-crossing. Cytological study of pollen mother cells of the $F_1$ hybrid showed chromosome behavior in meiotic division to be quite irregular. The sterility of the $F_1$ plant seemed due to the formation of abortive germ cells. In reciprocal interspecific crosses in Gossypium better success was obtained with the larger chromosome number in the female parent than with its reciprocal crosses, confirming observations of Thompson with wheat (E. S. R., 63, p. 817).

**Hybridization experiments with Fragaria**, E. Schiemann (*Geschlechts- und Artkreuzungsfragen bei Fragaria. Jena: Gustav Fischer, 1931, pp. 112, pls. 8, figs. 35*).—Diploid and octoploid species of strawberry and their progeny were crossed in these experiments at the Berlin-Dahlem Institute for Plant Breeding and detailed observations made on sex expression, fertility, and chromosomal relations in the progeny. The results indicated that genetic females are allelomorphic to males + hermaphrodites. Females were generally fertile, but within the class male hermaphrodites there were observed five degrees of sterility—(1) morphologically pure males, (2) physiological males, (3) physiologically weak males, (4) andromonoecious forms, and (5) completely fertile hermaphrodites. The physiological males, andromonoecious forms, and the completely fertile hermaphrodites formed a quantitative series the multiple allelomorphic nature of which is conjectured but not established.

The original parental lines possessed varying tendencies to transmit sterility to the progeny. The instability in fertility was shown in four types of female degeneration and two of male degeneration, (1) loss of entire anthers and (2) reduction of anthers to staminoidea. The sex of the pistillate varieties was more stable than that of hermaphrodites but nevertheless subject to change.

Phenotypic sex reversal occurred very often in Fragaria, and genotypic change was also observed. In both sexes bud and seedling mutations appeared. In combinations of octoploids and diploids, seedlings with the octoploid mother were vegetatively more vigorous and also developed their anthers to a greater degree. A large $F_1$ octoploid × diploid population showed all stages from octoploids to diploids, notwithstanding that all plants were true pentaploids. The $F_1$ of crosses between octoploid and diploid plants showed combinations of the characters of both parents.

No evidence was seen of parthenocarpy, whether direct or induced by cross pollination. A series of possible matroclinous hybrids was observed. All crosses between gradations within a series were sterile. An octoploid hybrid ♀ × a physiological ♂ was sterile because the *F. chiloensis* male parent apparently carried dominant sterility factors.

**Ontogeny, genetics, and cytology of Nicotiana hybrids,** D. Kostoff (*Genetica [The Hague], 12 (1930), No. 1, pp. 33–118, pls. 10, figs. 3*).—The several investigations carried on with Nicotiana hybrids at the Bussey Institution and reported in some detail were concerned with compatibility, embyro development, and vigor in Nicotiana species crosses, the slow growth of hybrid embyros and the behavior of the starch in ovules fertilized by foreign pollen, other abnormalities in ovules carrying hybrid endosperm and embyro, gamete formation in hybrids, cytology and physiology of the tapetum, irregularities in nuclear and cell division, incompatibility and sterility, and certain physiogenical aspects connected with hybridization and reproduction.

**Chromosome numbers in angiosperms, III,** L. O. Gaiser (*Genetica [The Hague], 12 (1930), No. 2–3, pp. 161–260*).—The present list of chromosome numbers includes the results of research published during 1929 and some of the 1928 studies not incorporated in the previous number of this series (E. S. R., 65, p. 522).

**Sex chromosomes in plants** [trans. title], F. Brieger (*Züchter, 3 (1931), No. 3, pp. 83–92, figs. 12*).—A review of literature comprising 30 titles.

**Sex ratio and sex expression in the cultivated cucurbits,** T. W. Whitaker (*Amer. Jour. Bot., 18 (1931), No. 5, pp. 359–366, figs. 3*).—Observations on 49 varieties representing 8 species and 4 genera of cucurbits showed each to have a specific qualitative type of sex expression. In certain species varieties had specific types; for example, in the muskmelon, typically andromonoecious, the variety Mexican Banana was monoecious. Concerning quantitative differences, staminate flowers were at all times greatly in majority in all the cucurbits studied. The possibility that sex ratio may be altered to some extent by variations in the environment is admitted.

**Inheritance of type in Angora goats,** J. M. Jones and B. L. Warwick (*Texas Sta. Rpt. 1930, pp. 24, 25*).—From a study of various fleece characters in the ringlet and flat-lock types of Angora goats it was found that the diameter of the fibers was not related to the type of lock produced by the goat from which the fibers were taken. There was a greater amount of grease in the flat-lock fleeces sheared at the ages of from two to five years, making the fleece weights greater. While individuality was an important factor as to the fineness of fiber, other influences were as great or greater factors in determining the fiber diameter. The weight of fleece and staple length showed a low correlation with the belly covering at the first kid fleece, but no correlation at older ages nor with the face covering or fineness of fiber. Staple length was correlated with animal weight at six months of age. Certain of the correlations obtained in connection with the kid fleeces were not observed at older ages owing to the culling of the flock for certain undesirable characters. Birth weight was not correlated with any of the fleece characters studied.

## FIELD CROPS

**Effects of different systems of grazing by cattle upon a western wheatgrass type of range near Fort Collins, Colorado,** H. C. Hanson, L. D. Love, and M. S. Morris (*Colorado Sta. Bul. 377 (1931), pp. 82, figs. 41*).—The effects of the continuous system and the deferred and rotation system of grazing upon range vegetation were determined, using cattle, in the period 1921–1930 and intensively since 1926. The vegetation consisted chiefly of western wheatgrass (*Agropyron smithii*), other important species being blue grama grass (*Bouteloua gracilis*), buffalo grass (*Bulbilis dactyloides*), porcupine grass (*Stipa* spp., especially *S. viridula*), three-awned grass (*Aristida longiseta*), Texas crabgrass (*Schedonnardus paniculatus*), and a number of forbs. Precipitation, evaporation, humidity, soil and air temperature, soil profiles, soil moisture, and analyses of the soil at various depths were also recorded or determined and are discussed.

The earliest growth of the vegetation usually began about March 15, the seasonal growth was most rapid during May, blooming was at its height in June, drying began in several species in July, and by early August many species had dried and disappeared. The ripening and drying continued throughout August and September, and a few late summer species bloomed. Low temperatures retarded the growth rates of grasses in early spring, *Stipa viridula* being less sensitive than *Agropyron smithii* and both in turn less sensitive than Bouteloua, Bulbilis, Schedonnardus, or Aristida. Usually vegetative growth was complete by late June when soil moisture generally was depleted. Bouteloua and Bulbilis, however, renewed vegetative growth later in the summer if showers made soil moisture ample.

The best data on the effects of the two systems in the study appeared to be from the 30 list quadrats (2 meters square) distributed systematically in each pasture. In 1929 the stalks per quadrat averaged 912±75.23 in the deferred and rotation pasture and 597±50.48 in the continuous pasture, the difference appearing due chiefly to the different systems of grazing operative for 9 years. *Bouteloua gracilis*, *Psoralea tenuiflora*, *Artemisia gnaphalodes*, *A. frigida*, and *Aster hebecladus* were among species with greater abundance and frequency in the continuous pasture than in the deferred and rotation pasture, whereas *Agropyron smithii*, *Eurotia lanata*, *Schedonnardus paniculatus*, *Senecio perplexus*, *Stipa viridula*, and *Aristida longiseta* were more abundant and frequent in the deferred and rotation pasture. All of these species were grazed by the cattle. Stalks of desirable species counted totaled 54 per cent more in the deferred and rotation pasture, of undesirable species 18 per cent less, and of immaterial species 27 per cent greater than in the continuous pasture. In 1926 and 1927 the flowering stalks of *Agropyron smithii* and *S. viridula* averaged taller in the deferred and rotation pasture, and the weight and germination percentage of seeds from *S. viridula* were greater than in the continuous pasture.

Data from quadrats in isolation transects, clipped quadrats, and major quadrats (10 by 10 ft. and 16 by 16 ft.) were less decisive. For the period 1926–1930 Agropyron increased more under continuous grazing than under total protection from grazing or deferred and rotation grazing. For several reasons these results were not considered as reliable as those based upon the many list quadrats. It appeared, however, that increasing abundance of Psoralea, *Artemisia gnaphalodes*, and *Sophora sericea* (none grazed) and decreasing abundance of *Senecio perplexus*, *Helianthus pumilis*, and *Astragalus drummondii* (all grazed) may serve as delicate indications of grazing methods unsuitable for the maintenance of the vegetation best for cattle. Many changes developing in these quadrats, particularly with Schedonnardus, appeared due more to environmental conditions or to competition pressure than to differences in the grazing systems.

**[Crop experiments at the Moses Fell Annex Farm, Bedford, Ind.]**, H. J. REED and H. G. HALL (*Indiana Sta. Circ. 183 (1931), pp. 9, 10, 24*).—The average acre yields of varieties of winter wheat, rye, and barley, oats, and soybeans and of the spring wheat, rye, and barley, and cowpeas are listed as heretofore (E. S. R., 64, p. 130). The response of pasture to fertilizers, manure, and lime and of tobacco to fertilizers is reported on briefly.

**[Crop tests in New Hampshire]** (*New Hampshire Sta. Bul. 256 (1931), pp. 14, 15*).—Comparative tests of clover varieties, strains of flint and dent corn, and of oats with annual legumes are noted briefly. Oats and peas and oats and spring vetch led the combinations in dry weight of forage.

Hay cut on June 10 when the heads were appearing had the highest percentage of protein and on June 30 the greatest yield of protein per acre, while the heaviest yield of hay was obtained on July 10. After July 10 the total yield decreased slightly, while the acre yield of protein fell off rapidly after June 30.

**[Field crops investigations in Texas]**, E. B. REYNOLDS, P. C. MANGELSDORF, R. E. KARPER, G. T. MCNESS, R. H. WYCHE, C. A. BONNEN, R. A. HALL, P. R. JOHNSON, R. H. STANSEL, H. DUNLAVY, S. E. WOLFF, P. B. DUNKLE, R. E. DICKSON, D. L. JONES, J. J. BAYLES, H. F. MORRIS, J. R. QUINBY, W. H. FRIEND, and C. H. MCDOWELL (*Texas Sta. Rpt. 1930, pp. 42, 43, 44–46, 47, 48, 51, 53, 54, 55, 95, 96, 97, 98–101, 102, 103, 105–107, 108, 109, 111, 112, 115–118, 119, 120, 122, 123, 124, 126, 127, 128, 129, 132–135, 143, 144, 145, 151*).—Variety tests with corn, wheat, oats, barley, rice, grain sorghum, sorgo, broomcorn, sugar beets, potatoes, peanuts, soybeans, cowpeas, alfalfa, sweetclover, lespedeza, winter peas, vetch, and miscellaneous grasses and legumes; breeding work with wheat, oats, barley, corn, rice, grain sorghum, sorgo, and peanuts; cultural (including planting) trials with corn, wheat, grain sorghum, sorgo, potatoes, peanuts, and alfalfa; comparisons of corn and grain sorghums; fertilizer trials with crops in rotation, corn, wheat, oats, rice, grain sorghum, and potatoes; weed control experiments; pasture studies; and crop rotations are again (E. S. R., 63, p. 435) reported on from the station and substations.

Cultivation chiefly for and enough to control weeds again appeared the most practical kind in tests since 1918 with corn, cotton, and grain sorghum in several localities. At Lubbock late (April) deep plowing produced the highest yields of cotton and milo. At Beeville cotton cultivated every four weeks gave better lint yields than that cultivated every two weeks or hoed, whereas hoed corn outyielded cultivated corn. Plowing was slightly better than listing or disking in preparing the seed bed for winter wheat at Chillicothe; whatever method is used, preparation evidently should be as early as possible, at least by July 31.

In comparisons of grain sorghum varieties with corn, Schrock, the best yielding grain sorghum at Denton, made 36.2 bu. per acre and Surcropper corn 32.4, and at the station Darso 37.1 bu. and Surcropper 33.3 bu. The best grain sorghum and Thomas corn yielded about alike at Beeville. At Weslaco corn outyielded the best grain sorghum by 15 bu. The best grain sorghums at Troup yielded only half as much grain per acre as the best corn variety and at Angleton only two-thirds as much. At several localities Darso and Schrock yielded more grain than Blackhull kafir and milo. They suffered less damage from birds and probably also from the sorghum midge and seemed better adapted to the more humid conditions in eastern Texas.

Seeding tests at Chillicothe indicated that under good conditions for germination and emergence 1 lb. of milo and 2 lbs. of kafir and Sumac sorgo are enough for desired stands. A good farm practice is to plant enough milo for a stand under unfavorable germination conditions, and if conditions are favorable and too thick a stand is obtained to list out every third row. Results with milo showed that it can feed over a large area, and that leaving every third row blank will not reduce the yield materially. Spur feterita seed treated with copper carbonate germinated 31 per cent better than untreated seed and treated with organic mercury compounds from 38 to 40 per cent better.

Grain sorghum varieties at Denton varied somewhat in their effect upon oats following. Although all varieties reduced oats yields from 25 to 50 per cent, the yield of sweetclover following sorghums was not reduced. It appeared that sorghum stubble and stalks should be turned under soon after harvest to give as much time as possible for decomposition before the next crop. Over a 5-year period at Angleton rotated corn averaged 26 bu. per acre, or 62.5 per cent, over nonrotated corn, whereas rotated cotton did not outyield continuous cotton, suggesting that cotton may be grown continuously with less loss in yield than corn. During 13 years at Denton inclusion in a 4-year rotation with either cowpeas or sweetclover increased the yield of wheat 119 per cent, oats 67, corn 16, and cotton 19 per cent over these crops planted continuously.

Fertilizers did not appear profitable for cotton and corn on the dark soils in the region around Beeville, and no fertilizer applied to corn was profitable at Troup. Applications of fertilizer at Temple totaling for 3 years 2,400 lbs. per acre of a 4–12–4 mixture showed no consistent increase in the yield of corn or cotton. Superphosphate as shown by cotton and corn yields was the chief need of soils at Angleton, but more than 200 lbs. of superphosphate did not result in increased yields except where nitrogen was added. Nitrogen alone was without value, and potash had no value except in a complete fertilizer applied at the rate of more than 500 lbs. per acre.

Both ammonium sulfate and superphosphate alone or in combination made the largest yield of rice at Beaumont when applied 12 weeks after planting. Fertilizers evidently could not be used profitably on land badly infested with weeds, actually decreasing the yield of rice. The best fertilizer treatment was 100 lbs. of ammonium sulfate per acre at planting.

Sweetclover seeding trials at Chillicothe indicated that better stands and yields could be secured by planting in the winter and that better stands can be had from normal seed in winter but from scarified seed in late spring and summer. Higher yields but poorer quality of forage was made in 32-in. rows than in 8-in. drills. Austrian winter peas as a nurse crop were more detrimental than beneficial.

Sodium arsenite effectively killed such annuals as cocklebur, sour grass (*Panicum fuscum*), and common ragweed but failed to control Johnson grass, nor was the latter controlled by kerosene. Sodium chlorate at the rate of 109 lbs. per acre gave a 90 per cent control, and similar applications of a commercial weed killer 78 per cent control. Results were slightly better with the low rate applications of chlorates at 0.5 lb. than at the rate of 1 lb. per gallon of water, due to the better coverage with the 0.5-lb. mixture.

**Border effect in variety tests of small grains**, H. W. HULBERT, C. A. MICHELS, and F. L BURKART (*Idaho Sta. Research Bul. 9 (1931), pp. 23, figs. 12*).—Harvest by individual rows of 14-row plats gave evidence that so far as White Odessa and Triplet wheat are concerned border effect is operative only through the two outer (border) drill rows. The plat yields of varieties of wheat and oats showed that border effect may so augment the yield as to misrepresent the true variety yield, and indicated the need for removing border rows before computing yields on varieties. There were indications that varieties may differ in their demands upon alley space, and that border effect is influenced by seasonal conditions. In rate of seeding tests with spring wheat the border effect increased as the acre rate increased, regardless of seasonal conditions, whereas data on winter wheat showed only a small positive correlation between seeding rate and border effect increases. See also an earlier note (E. S. R., 57, p. 725).

**Spring grain varieties in the Panhandle of Oklahoma**, H. H. FINNELL (*[Oklahoma] Panhandle Sta., Panhandle Bul. 30 (1931), pp. 3–11*).—Average yields of all spring varieties tested through the period 1924 to 1931 were for oats 14.97 bu., barley 13.56, and wheat 5.42, the best variety of oats (Fulghum) yielding 17.23 bu., barley 15.37, and of wheat (Marquis) 5.82 bu. Two row types of barley outyielded the common 6 row varieties. The spring oats and wheat were complete failures in 3 years of the 8 and barley in 2 years. Two-row barley averaged about the same as winter wheat in pounds per acre and about 100 lbs. less than winter barley, whereas spring oats and spring wheat both produced less than winter wheat.

**[Cotton investigations in Texas]**, D. T. KILLOUGH, E. B. REYNOLDS, G. T. MCNESS, R. A. HALL, P. R. JOHNSON, R. H. STANSEL, R. H. WYCHE, H. DUNLAVY, P. B. DUNKLE, R. E. DICKSON, D. L. JONES, J. J. BAYLES, H. F. MORRIS, J. R. QUINBY, W. H. FRIEND, and C. H. MCDOWELL (*Texas Sta. Rpt. 1930, pp. 41, 42, 43, 44, 46, 47, 94, 95, 96, 98, 102, 103, 105, 109, 110, 112, 118, 120, 123, 124, 126, 127, 128, 131, 132, 144, 150, 151*).—Variety, cultural, and fertilizer tests, breeding work, inheritance studies, and harvesting and ginning experiments (E. S. R., 64, p. 736) at the station and substations are again (E. S. R., 63, p. 430) reported on.

Mebane and its related strains, such as New Boykin, Harper, Cliett Superior, Kasch, and Qualla; Lone Star and its strains; Truitt; and Acala types of cotton continued to be the better varieties for Texas conditions. Delfos and Lightning Express cotton, with longer staple, appeared to be especially well suited to conditions in the more humid parts of the Gulf Coast section.

Cotton spaced 9 in. apart in the row produced the highest yield over a period at Spur, but only slightly higher than from spacings of 12, 15, and 18 in. In dry years the wider spacing made materially larger yields. Recommended or highest yielding spacings were 18 to 30 in. at Chillicothe, 6 in. at Lubbock, and 18 in. at Iowa Park. At Lubbock cotton planted in paired rows or with every third row uncropped yielded only 79 per cent as much lint as when each row was planted as usual. For the past decade on the fine sandy loam on the Lubbock Substation, late preparation gave slightly better yields than fall or winter preparation with both cotton and grain sorghum. Plowing 7 in. deep proved better than 3.5 in. deep and also better than listing deep or shallow.

There seemed no consistent relation between date and method of preparation and yield at Chillicothe provided the soil was stirred thoroughly about 5 in. deep before weed growth starts in the spring, probably due to low winter rainfall.

During 3 years at Troup 8-12-4 fertilizer at the acre rate of 400 lbs. outyielded other grades at the same rate, but not enough to be as profitable as 4-6-4 or 4-8-4 mixtures. Ammonium sulfate was more profitable than equivalent amounts of sodium nitrate or cottonseed meal. Applying all fertilizer in the drill before planting resulted in larger yields than when one-half the nitrogen was side dressed after chopping. Fertilizers besides increasing lint yields also increased the size of boll, percentage of 5-lock bolls, and the percentage of shedding, but did not seem to affect the percentage or length of lint. Applications at Balmorhea of phosphoric acid or potassium fertilizers caused very little increase in yields of cotton or alfalfa, although a slight increase came from superphosphate on alfalfa when watered heavily. Nitrogenous fertilizers on cotton on poor land gave a slight increase in lint yield but none on land producing alfalfa within the past two or three years. Commercial fertilizers and barnyard manure applied to cotton gave no consistent yield increases at Chillicothe. Each fertilizer combination used at Iowa Park yielded more seed cotton than no treatment, yet the increased yield often was not enough to offset the additional cost. At this substation irrigating every 10 days produced considerably more lint cotton than when water was supplied every 20 or 30 days.

**Rate of seeding for peas,** H. W. Hulbert and F. L. Burkart (*Idaho Sta. Bul. 181 (1931), pp. 8, fig. 1*).—Seeding tests with field peas involving drill calibration studies (E. S. R., 57, p. 528) indicated that acre rates taking into account the size of seed are necessary for maximum yields of the several varieties, being for Green Admiral 95 lbs., White Canada 100, Bangalia 105, Alaska, Horsford, and Perfection 120, Kaiser 130, Bluebell 140, American Wonder 155, Solo 170, and White Marrowfat 175 lbs. The number of seeds per pound is held the most accurate index to seeding rate. The seed size of individual varieties was observed to vary slightly in different seasons. From 4 to 5 plants per square foot appeared to produce the highest yield, regardless of variety. For optimum stands from 6 to 7 seeds, weevil free and carefully graded, must be delivered per square foot.

**The influence of nitrogen, phosphoric acid, and potash on the number, shape, and weight of potato tubers,** W. H. Martin, B. E. Brown, and H. B. Sprague (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 3, pp. 231–260, figs. 16*).—A series of experiments were made at the New Jersey Experiment Stations in cooperation with the U. S. D. A. Soil Fertility Investigations to determine the effects of nitrogen, phosphoric acid, and potassium on total weight of potato tubers per hill, tuber length, width, and thickness, number of tubers per plant, and weight of individual tubers. The 21 fertilizer mixtures each contained 15 units of plant food according to the triangle method of Schreiner and Skinner (E. S. R., 40, p. 126), and certified Irish Cobbler seed potatoes were planted in each year from 1925 to 1928.

Total yield and the number and weight of tubers were influenced by seasonal conditions. The yields were influenced more by differences in number than in weight of individual tubers. While the longest tubers were grown in the season of greatest rainfall, this seemed due to the influence of the soil moisture content on the availability of the fertilizer rather than to direct action on the tuber.

Fertilizer mixtures producing the widest tubers were characterized by low to high nitrogen, low phosphoric acid, and low to high potash, whereas the thickest potatoes resulted from mixtures with low to high nitrogen, low phosphoric acid, and medium to high potash. The longest tubers and also those with the highest shape index values were grown by mixtures medium to high in nitrogen and phosphoric acid and low in potash, while the shortest tubers came from mixtures with no nitrogen to low nitrogen, low to medium phosphoric acid, and medium to high potash. The quantity of potassium present appeared chiefly responsible for modification of shape of the tuber. With fertilizer mixtures deficient in potassium but containing nitrogen, tubers with high index values were obtained, but without nitrogen and with abundant potassium the potatoes were shorter.

Considering all tubers, the largest were produced by mixtures with large quantities of nitrogen, with none to small quantities of phosphoric acid and none to large quantities of potash. The most tubers in this class were produced by mixtures low in nitrogen, low to high in phosphoric acid, and high in potash and the fewest tubers by mixtures high in nitrogen with none to little potash. The largest total yields of tubers in this class were produced by mixtures having both nitrogen and potassium in medium to large quantities and phosphoric acid in small quantities.

The largest of tubers weighing 40 gm. or over were grown by mixtures with medium to high nitrogen, low phosphoric acid, and low to high potash, the fewest by mixtures with none to low nitrogen, high phosphoric acid, and low to high potash, and the highest total yields by mixtures containing medium to high nitrogen and potash and low phosphoric acid. When potatoes weighing 75 gm. or more were considered, the largest were made by mixtures high in nitrogen, low to medium in phosphoric acid, and low to medium in potash, the most tubers by mixtures medium to high in nitrogen and potash, the fewest by mixtures containing no nitrogen, and the largest total yields by mixtures carrying medium to high nitrogen, none to high potash, and none to medium phosphoric acid. Low total yields, however, were made by mixtures lacking in either nitrogen or potash. The absence of nitrogen was in general the most important factor contributing to low yields. The fertilizer mixtures affected total yield of tubers weighing 75 gm. or more by producing more tubers in this class rather than larger individual tubers.

**The cause and prevention of mechanical injuries to potatoes,** H. O. Werner (*Nebraska Sta. Bul. 260 (1931), pp. 35, figs. 16*).—Factors affecting susceptibility to injury of potatoes, including variety and strain differences, maturity, tuber growth rate, exposure to air just after harvest, tuber size, depth of planting, direction of rows, soil conditions, and Rhizoctonia infection, were studied at different times from 1928 to 1930 along with the causes of injuries in digging, in picking, and in pouring potatoes from picking baskets into sacks. The healing process with wounds in potatoes has been noted earlier (E. S. R., 65, p. 823).

Experience of potato growers and the experiments here reported indicate that much of the damage can be avoided by proper attention to methods of handling and proper equipment. Suggestions are made to meet the problems of handling Triumph potatoes in western Nebraska where the crop is harvested in late September and early October. The potatoes should be reasonably mature. Excessively moist or hard, dry soil might in certain cases be avoided by judicious irrigation. Some cutting of tubers can be eliminated by throwing the soil slightly toward the rows in cultivation or by throwing up a ridge late in the season so that the digger wheels will be slightly lower. Since the digger handles the potatoes when very delicate and often does most of the harvest damage, considerable care should be used in its selection and in adjustment.

Adjustments and a few simple improvements to increase the efficiency of any digger are outlined.

Potatoes should remain on the ground for several hours after digging to permit the skin and dirt thereon to dry thoroughly. If the temperature is unseasonable, 80° F. or higher, exposure for about 1 hour should suffice. The sides of picking baskets should be lined or padded to reduce shock, and care should be used in placing the potatoes in the basket, in sacking, and in settling tubers in the sacks. Precautions are given against handling potatoes in bulk, as to the use of the half sack and full sack methods and wooden crates, and in filling bins. The storage cellar should be quite high in humidity when the potatoes are brought in so as to hasten wound healing and to reduce water loss. A temperature of from 55 to 65° F. for about 1 week after harvest with adequate ventilation is probably optimum. After about 7 or 10 days it should be dropped as rapidly as possible to about 40°.

**[Sugarcane variety tests]** (*Louisiana Stas. Bul. 226 (1931), pp. 36*).—The investigations are reported on in two parts. See also another note (E. S. R., 65, p. 132).

I. *Sugarcane variety test fields*, C. B. Gouaux (pp. 3–26).—Varieties of sugarcane (E. S. R., 63, p. 435) growing in comparison as plant cane and first and second stubble at Cinclare, Glenwood, Reserve, Meeker, Sterling, and Youngsville, La., were harvested in the fall of 1930 and subjected to milling tests. The meteorological conditions and relative growth of the several varieties are described for each locality, and the Brix, sucrose, tonnage, and values are tabulated for 1930 and sugar production summarized for varieties tested from 1927 to 1930.

II. *Sugarcane variety report for season 1930–31*, E. C. Simon (pp. 27–36).—The Brix, sucrose, and purity of plant and stubble cane and relative yields and values are tabulated from station tests for C. P. 807, Co. 281, and a number of P. O. J. varieties of sugarcane, and the merits of new varieties from the United States Breeding Station at Canal Point, Fla., are indicated.

C. P. 807 was characterized by early growth, maturing a fair sucrose content rather early, and by vigor, and was comparatively free from disease. Co. 281 gave good results as plant cane and first and second stubble in yields of cane and sugar. It seemed to tend to sucker on until late in the season and to have a sucrose content almost comparable with P. O. J. 234, but apparently is not so early maturing. Co. 290 was the most vigorous cane currently grown at the station, surpassing C. P. 807 in tonnage per acre, both as plant and stubble cane, and ranking with P. O. J. 213 in sucrose content.

**Wheat varieties of Washington in 1929**, E. F. Gaines and E. G. Schafer (*Washington Col. Sta. Bul. 256 (1931), pp. 23, figs. 5*).—A survey made in 1929 showed that of 99 per cent of the wheat crop in bushels spring varieties made up 36.4 per cent and winter sorts 62.6 per cent. Of the spring wheats Baart produced 14.2 per cent, Federation 8, Bluestem 3.8, Jenkin 2.5, Marquis 2.5, and Thompson 2.4 per cent, and the leading winter varieties included Hybrid 128, 13.1 per cent, Triplet 12.1, Turkey 10.3, Ridit 9.8, Fortyfold 7.2, and Albit 5.8 per cent. The adaptations of the several varieties are noted briefly and their distribution areas are indicated on outline maps. Changes taking place in varieties grown since previous surveys (E. S. R., 59, p. 528) appeared due largely to superiority of new varieties in meeting the needs of the grower, dealer, and miller. When the 12 leading varieties were classified according to federal grades, 4 red wheats made up 34.7 per cent of the crop and 8 white wheats 57 per cent.

**Report of the seed commissioner for the biennium 1929–1930**, R. S. Bristol (*Idaho Sta. Circ. 63 (1931), pp. 12*).—This report includes the text of the seed law of Idaho, official grades for the sale and distribution of seeds of legumes, a summary of results of the tests made of 5,471 samples received, and comments on the inspection work during the biennium.

**Effect of chlorates upon the catalase activity of the roots of bindweed,** J. R. Neller (*Jour. Agr. Research [U. S.], 43 (1931), No. 2, pp. 183-189, figs. 2*).—The catalase activity of roots of bindweed in Washington Experiment Station studies (E. S. R., 62, p. 37) was decreased greatly after the plants were sprayed thoroughly with chlorates. Following sodium chlorate spray in August, the catalase activity of roots obtained from the surface foot the next March was one-half that of untreated roots. In another plat similarly treated the catalase activity of roots in the first, second, third, and fourth foot sections was, respectively, one-fourth, one-half, one-half, and five-sixths that of roots on similar sections of an untreated area. The catalase activity of the roots in plats receiving much lighter application was reduced little or not at all in the first foot and none in the second foot section, and later inspection of surface growth showed only partial eradication. For complete eradication of bindweed the toxicity of the chemical evidently must be enough to lower distinctly the catalase activity of the roots to a depth of 2 ft.

## HORTICULTURE

**[Horticulture at the Moses Fell Annex Farm, Bedford, Ind.],** H. J. Reed and H. G. Hall (*Indiana Sta. Circ. 183 (1931), pp. 10-17, figs. 7*).—The Roberts prune was found unusually late in opening its buds. Because of the ravages of the oriental peach moth the Krummel October and Salway varieties were discarded, even though hardier in the bud than Elberta. Gold Drop and Crosby because of their thick fuzz and relatively late maturity were also severely attacked by the insect. J. H. Hale and Big Red were discarded as less desirable than Elberta. Rochester, Champion, Belle of Georgia, and Hiley were found desirable for home use, their fruit being superior to Elberta for canning and their flower buds more resistant to cold. An orchard of 14-year-old peaches was successfully rejuvenated by heavy pruning.

As a measure to reduce arsenical residue, two oil-nicotine sprays were substituted for two of the arsenical applications but failed to give satisfactory control of codling moth. Data are submitted on the cost of installing and operating stationary spray plants. A comparison of ice-cooled with ordinary farm storage indicated that ice may be profitably used in southern Indiana to hold early fall apples for a brief period. The cost of ice per bushel of fruit declined from 23.5 cts. in 1925-26 to 13 cts. in 1930-31, due to the result of finding that a shorter period of icing gave satisfactory results.

**[Horticulture at the New Hampshire Station]** (*New Hampshire Sta. Bul. 256 (1931), pp. 10-13, figs. 2*).—As determined by J. R. Hepler in greenhouse tests crosses between standard varieties of tomatoes generally outyielded their parents, the English variety Sunrise being an exception. Ponderosa crosses were most promising.

Orchard fertilizer experiments conducted by G. F. Potter indicated the need of applying nitrogen only in the spring. Where the nitrogen application was divided, part in the spring and part in June or July, the delayed applications merely added to the nitrogen reserve in the tree and was carried over to the succeeding spring. To determine whether a so-called complete fruit fertilizer is of greater value than materials containing an equivalent amount of nitrogen, trials were initiated in a McIntosh orchard at Durham and in a Baldwin orchard at Wilton, but in both cases the first year's results were not significant.

It is considered likely in the light of research elsewhere that better results might follow the use of potassium and phosphorus if the materials were inserted deeply into the soil. Attempts in the Woodman Baldwin orchard to plow the phosphorus fertilizer deep into the soil gave some indications of a favorable response to phosphorus as pertains to yield.

Storage experiments conducted by E. J. Rasmussen showed that McIntosh apples can be kept well into the next summer in cold storage. It is conceded, however, that ordinary storage is better for keeping McIntosh to Christmas, as it allows continued slow ripening. For late keeping 30° F. was best as regards firmness and 32° as regards flavor. Precooling to 30° was found to improve keeping quality, and not more than 5 days should elapse between picking and storing. Comparing the keeping quality of McIntosh from sod and from tilled orchards, no differences were found. There was a difference in the case of Baldwin, in which variety ground color and pressure tests were not always reliable indications of keeping quality. In cold storage apples lost only from 1.25 to 2.5 lbs. per box from November 1 to June 1, while in common storage losses continued at the same rate up to March 15.

The first crop of Iceberg lettuce harvested in 1930 by R. B. Dearborn on the experimental plats at Lancaster was of excellent quality, having solid heads and keeping equally as well in a commercial storage as did western lettuce. Subsequent shipments fell off in firmness and quality due to the wet, cloudy weather. Greenhouse studies with lettuce indicated that the growth of seed stalks is directly proportional to temperature. Using soil from the Lancaster plats, it was found that under greenhouse conditions superphosphate markedly stimulated growth. A combination of medium nitrogen and high phosphorus gave the best returns. A 5–8–2 mixture was employed in a commercial plantation.

**[Horticultural investigations at the Texas Station]** (*Texas Sta. Rpt. 1930, pp. 16–22, 101, 104, 107, 108, 109, 110, 124, 125, 126, 129, 130, 135, 141–143, 144, 145, 146, 151, 152*).—Attempts by F. R. Brison and G. W. Adriance to propagate the pecan from root cuttings showed considerable callusing, with a tendency to sprout in one instance. Approximately half of *Carya aquatica* root cuttings sprouted.

According to J. J. Bayles, Wilson, and H. F. Morris, difficulty in selfing Honey Ball muskmelons delayed the development of desirable homozygous types. Considerable differences were observed in the quality, flavor, and external characters of seedlings.

Investigations by Yarnell, J. J. Taubenhaus, Johnson, Friend, W. N. Ezekiel, and W. J. Bach showed all the northern tomato varieties possessing resistance to wilt to be susceptible to the southern type of wilt.

Preliminary observations by Stansel in crapemyrtle breeding showed that no fruits formed under bags, although an ample number set outside.

At the Beeville Substation records were taken by R. A. Hall on the cost of producing tomatoes and a test made of various fertilizer mixtures for this crop. All citrus trees were killed back to the soil, but because of heavy banking made rapid recovery in most cases. The honey type of peach was the only one to bear fruit in a 5-year-old orchard. The Methley plum was found highly promising and the Carmen grape the best in this fruit. Cotton root rot killed 70 per cent of the ornamentals. *Tamarix articulata* killed to the soil by freezing grew from 5 to 10 ft. in a single season.

At Troup tung-oil trees suffered severely from freezing, but nursery stock grew strongly from the base. Various partially tender ornamentals were also badly injured.

At Angleton Stansel reports that a collection of 78 varieties of figs was killed to the ground. A study of the spread of lateral roots of a 6-year-old Magnolia fig showed the longest roots to be over 35 ft. in length. Pruning every year tended to cause the fig crop to ripen over too brief a period, suggesting the desirability of pruning moderately and in alternate years. Severe pruning depressed yields very decidedly. Citrus trees of all species were killed by the winter cold.

In citrus studies by R. H. Wyche at Beaumont the Meyer lemon was promising, especially with respect to its power to recover after winter injury. Satsuma oranges also thrived despite occasional severe damage. The Magnolia fig was the most promising variety. Light pruning was found advisable for increasing yields, and spraying with Bordeaux mixture was necessary in the control of fig rust.

Very promising results were secured by D. L. Jones at the Lubbock Substation with the Chinese elm and with Chinese arborvitae, red cedar, Arizona cypress, and western yellow pine.

Tests at Balmorhea by Bayles indicated that the vinifera grape can be grown satisfactorily but that very few American varieties can endure the hot, dry climate. The Champanel grape appeared resistant to cotton root rot. Pears, apricots, peaches, and plums were grown successfully when not damaged by early freezes or cotton root rot. Of muskmelons the Superfecto, Hale Best, and Golden Honeydew were the best. The Marglobe tomato was best among 75 kinds. A list is given of satisfactory ornamentals.

Attempts at Nacogdoches by Morris to isolate homozygous strains of the Honey Ball melon resulted in three high quality, productive types. Among ornamentals to succumb to freezing were the Himalayan cedar, Chinese tallow tree, Cape-jasmine, camphor-tree, and wax leaf Ligustrum.

Of ornamentals tested at Chillicothe by J. R. Quinby the Chinese elm was one of the most promising. Crapemyrtle, Abelia, wax leaf Ligustrum, and *Jasminum humile* were also promising.

At Weslaco, as reported by Friend, grapefruit trees 10 years old produced at the rate of 40 tons per acre. Mature trees withstood 22° F. with little or no damage. Summer applications of oil checked the spread of scales and mites, and gum disease and scaly bark responded very favorably to surgical treatment. Chlorosis appeared on certain trees located on soil with a large content of soluble salts. Heavy irrigations with long intervals between gave better results than did frequent light irrigations. Water penetrated most deeply in the interrow spaces. The effects of fertilizer were such as to suggest that soil fertility has not yet become a factor here. The desirability of legume cover crops was indicated and showed residual effects after two years. Irrigation before freezing weather apparently decreased the susceptibility of citrus to injury. The Foster pink-fleshed grapefruit was found inferior to the Pink Marsh. The Meyer lemon proved well adapted for local use, and the Clementine tangerine was promising. One-year orange and grapefruit budded on Rusk citrange and Thomasville citrangequat were more cold resistant than when on sour orange or Cleopatra mandarin. Sour orange, rough lemon, sweet lime, and Cleopatra mandarin suffered injury from cold when citrangequats, etc., were uninjured. Although successfully grafted to various citrus, Calamondin roots showed a tendency in some cases to uncongeniality. The results of varietal, pruning, and fertilizer tests with tomatoes are briefly discussed, and trials of dates, figs, grapes, vegetables, and ornamentals briefly summarized.

Of many plums tested at Iowa Park by C. H. McDowell, Opata was outstanding in yield, and Dr. Burton was the most productive peach.

**Some factors which influence growth and fruiting of the tomato, V. M. Watts** (*Arkansas Sta. Bul. 267 (1931), pp. 47, figs. 21*).—That the nitrogen nutrients supplied the tomato plant should be modified in quantity according to the time of year and the temperature maintained or obtaining was indicated in these experiments, conducted in part at the University of Wisconsin.

In plants grown in the greenhouse during cloudy short days, succulence decreased as the temperature increased. Vigorous but moderately succulent plants were most fruitful, but very vigorous succulent plants were unfruitful due to the production of abortive blooms and nubbins. Very woody, weakly vegetative plants were unfruitful due to the small number and the dropping of buds and flowers, even though pollinated. Low temperature often induced the development of irregular fruits. Under such conditions unfavorable to photosynthesis a reduction in the nitrogen supply is suggested as a means of increasing fruitfulness, by increasing the percentage set and thereby the yield despite decreasing plant size.

Increases in either light intensity or duration resulted in an increase in dry weight and carbohydrate content and a decrease in the percentage of nitrogen, with special reference to amino nitrogen. In high nitrogen plants such a condition meant increased growth and unfruitfulness and in low nitrogen plants decreased growth and increased fruitfulness. Increase in temperature produced results similar to those of increased light.

Evidence was obtained that when the nitrogen supply is limited a reduction in carbohydrates may increase fruitfulness, especially with reference to the percentage of set, and also increase the size of the plant. Moderate vegetativeness was more closely associated with fruitfulness than either extreme vegetativeness or extreme woodiness, quite irrespective of the environment which induced these conditions. Associated with modern vegetativeness and fruitfulness there was a balance between carbohydrates and amino nitrogen. High carbohydrate, especially starch, generally accompanied a low amino nitrogen content and low carbohydrate a moderate to high amino nitrogen content. Practical deductions are presented governing the growing of tomatoes in forcing houses and in the field.

**Effect of fall applications of sodium nitrate upon the color, keeping quality, and nitrogen content of apples, W. W. Aldrich** (*Maryland Sta. Bul. 326 (1931), pp. 363–405*).—Physical and chemical examination of apples from trees fertilized at different times in late summer with nitrate of soda showed no marked influences of the time of application on color or keeping quality.

In 1928 an August 19 application slightly decreased the color of Stayman Winesap and York Imperial but enhanced the color of Rome fruits. Later applications had no effect on color. Firmness in storage, as measured by the pressure test, was slightly decreased in York Imperial by the August 19 application but it had no effect on Stayman Winesap or Rome. The later applications had no influence on any of the varieties. In certain instances total nitrogen in fruit before picking was apparently higher on trees fertilized August 19 and September 3. In York Imperial fruits which showed decreased color and firmness as a result of August 19 treatment the percentage of nitrogen on October 1 was much larger than in fruit of the other varieties. With all three varieties sodium nitrate applied on August 19 increased the total nitrogen in the leaves and spurs within a period of 5 weeks, except in York Imperial spurs. Nitrate applied September 1 or September 16 did not significantly increase either leaf or spur nitrogen by October 1, although some increase was evident by October 30.

A repetition of the work in 1929 using only one variety, York Imperial, and increasing the application from 4 to 6 lbs. per tree showed no effects on storage quality from any of the three treatments, August 15, September 1, and September 15. Analyses of the fruit minus the seeds showed no appreciable effect on nitrogen content, but when the seeds were analyzed separately there was found a nitrogen increase from all three applications. The August 15 treatment apparently increased the red color of the fruit, with no effect from the later applications. Nitrogen applied August 15 and September 1 increased the green color, the catalase activity, and the nitrogen content of the leaves and delayed to the extent of about 2 weeks the movement of nitrogen from the leaf back into the spur. Nitrogen applied August 15 and September 1 increased the insoluble nitrogen in the spurs but had no effect on the nitrogen content of bark taken from the trunk. Bark from the scaffold limbs of nitrated trees showed some evidence of an increased nitrogen content.

**Factors affecting fruit setting.—I, Stayman Winesap, F. S. Howlett** (*Ohio Sta. Bul. 483 (1931), pp. 54, figs. 14*).—As the result of defloration tests the author concludes that competition among the several flowers of a cluster for nutrients is one of the principal factors underlying the first drop. Competition for food and water up to the full bloom stage was apparently not sufficiently keen to prevent flowers from setting fruit, provided some of the blooms were removed just as the anthers were exposed. The period of competition affecting fruit set was probably subsequent to pollination and during the first few days following petal fall. Competition occurred not only between the terminal and laterals but among the laterals themselves. The terminal flower was strongest and if uninjured depressed the set on the laterals, especially on the less vigorous clusters. Laterals subtended by a leaf were better able to compete with the terminal than those in axils of bracts, and in the absence of the terminal bloom the leaf subtended laterals were the stronger. The smallest lateral, usually the one adjacent to the terminal bloom and the last to open, failed to set as satisfactorily as did the larger lateral in the axil of a bract. Apparently the leaf subtending a lateral was a partial but not a dominant factor in setting.

Two distinct periods of abscission were observed in the Stayman Winesap, the second being of lesser importance. In Jonathan more fruit remained after the first drop, and the terminal flower had much less depressing influence on the laterals.

In pollination experiments Stayman Winesap was found highly self-unfruitful, with Gallia Beauty, Delicious, Starking, Golden Delicious, Grimes Golden, and Jonathan effective pollinizers.

Irregularity in chromosome behavior at megasporogenesis observed in the Stayman Winesap is deemed responsible for the heavy initial drop and partly responsible for the low degree of self-fruitfulness in this variety. Such irregularity was scarce in the Jonathan. A high plane of nutrition was found to compensate in part for these irregularities in chromosome behavior and to permit the tree to carry a full commercial crop, provided adequate cross-pollination was supplied. Frosts have been the principal limiting factor on the fruit setting of Stayman in Ohio. Practical suggestions as to pruning, fertilizing, and pollination are given.

**Spray residue and its removal from apples, O. W. Ford and C. L. Burkholder** (*Indiana Sta. Bul. 345 (1931), pp. 18, figs. 6*).—Preceded by a general statement of the problem and of methods employed, the results are presented of experimental trials in the years 1927 and 1930 when lack of rainfall led to unusually high residues. No acid injury was noted in 1927 on apples dipped for 6 minutes in a 1 per cent hydrochloric acid solution nor on fruit dipped for 4 minutes in the same strength in 1930. Two and 4 per cent acid solutions caused very definite injury, the amount being directly related to the strength of acid used. Furthermore, irrespective of injury, the 2 and 4 per cent solutions were not sufficiently more effective in cleansing to warrant their use. The addition of salt alone or in combination with acid was of no material help in reducing the amount of arsenic present. Wipers and brushes failed to reduce the arsenical residue. As concerns varieties, Rome, Stayman Winesap, Delicious, and Indian were most susceptible to acid injury, while Winesap, Grimes, and Ben Davis showed no material damage even from 4 per cent solutions. From 20 to 30 seconds' exposure to 1 per cent hydrochloric acid solution in the flood type commercial washer reduced the residue below the world tolerance of 0.01 grain $As_2O_3$ per pound of fruit.

**The fruiting habit of the peach as influenced by pruning practices,** R. E. Marshall (*Michigan Sta. Tech. Bul. 116* (*1931*), *pp. 58, figs. 26*).—Data are presented on the growth and fruiting performance of Gold Drop peaches planted in 1921, uniformly pruned in 1922 and 1923, and beginning in 1924 subjected to the following types of pruning: (1) Severe dormant, (2) no pruning, (3) dormant and summer thinned, (4) moderate dormant, (5) moderate dormant with summer pinching, (6) bulk pruned, and (7) light dormant pruning. Regardless of pruning treatment the trees in the experiment all produced an abundance of fruit buds. However, severe dormant pruning resulted in very low and unprofitable yields, not because of insufficient buds but because of their unfavorable distribution.

Pruning treatments influenced production and the regional distribution of fruit buds only as they influenced primary shoot length. The unpruned trees produced the largest percentage of short primary growths. The maximum total linear growth was produced on trees whose shoots were pinched back in June with the result of increasing the number of secondary shoots. Dormant heading had a tendency to force out long primary growths. Primary shoots produced one fruit bud for each 1.83 cm. of growth as compared with 2.31 cm. on secondary shoots.

Solitary fruit buds were of most value as potential fruiting units when on the shorter shoots. The percentage of nodes bearing leaf buds decreased slightly with increased shoot length, while the percentage of nodes bearing triple buds increased substantially with length until a primary shoot length of from 60 to 80 cm. was reached. The basal half of secondary shoots produced more multiple buds than did the distal portion.

Concerning winterkilling, fruit buds on the basal and median portions of shoots were generally more resistant than those on the distal section. Differences in mortality as related to the pruning treatments were found no greater than between single trees in the same lot. Inconsistent behavior was noted from year to year with respect to the type of bud suffering the most winter injury.

The general conclusion is reached that cultural and pruning practices in the peach orchard may be planned without much regard to fruit bud formation, fruiting habit, or winterkilling of fruit buds.

**Peach rejuvenation studies in Maryland,** A. L. Schrader and E. C. Auchter (*Maryland Sta. Bul. 327* (*1931*), *pp. 411–441, figs. 38*).—In 1920 Elberta and Greensboro trees 10 years old and badly neglected were, in conjunction with good culture, nitration, and borer control, subjected to different pruning treatments, namely, dehorning, moderately heavy pruning, light pruning, partial or gradual dehorning, and no pruning. All trees, even the unpruned, responded markedly in growth and in fruiting to the improved culture, yet there were decided differences. Moderate initial pruning in which the main branches and side limbs were headed back from 4 to 6 ft. and certain undesirable limbs completely removed gave the best results. Heavy dehorning dwarfed the trees, caused overvegetative development with few fruit buds, and made necessary a rather severe thinning the next two years. These trees failed to yield as well as did the moderately pruned. Partial dehorning in which the individual limbs were pruned with varying degrees of severity resulted unfavorably, namely, in low yields, weak or no growth on the dehorned stubs, and dwarfing of the entire tree. Good yields followed light pruning, but the fruits were small and the trees were not lowered in height. No pruning accentuated the undesirable features of light pruning, and in addition many of the limbs became brittle and broke down.

**Factors for consideration in standardization of Oregon dried prunes,** E. H. WIEGAND and D. E. BULLIS (*Oregon Sta. Bul. 291 (1931), pp. 35, figs. 11*).—Various factors, such as sanitation in the orchard and drying plant, the discarding of decayed and inferior fruits, the proper equipment of driers, and grading and processing, all of which play a part in the production of better quality prunes, are considered in this paper with a view to encouraging and assisting growers in improving their standards of quality to meet present demands.

As separated in salt solutions, fruits sinking in the heavier solutions had the highest specific gravities. Satisfactory maturity was indicated by high specific gravity. Prunes which had been experimentally processed had a lower specific gravity due to the imbibition of water. Prunes after storage graded out in the salt solutions much as they did when freshly harvested, although chemical analyses showed some increase in sugar while in common storage. Losses from decay were extremely heavy in common storage, attaining 46.1 per cent in one case. Fruits separated in solutions of the highest gravity had the lowest drying ratio.

**Citrus propagation,** A. F. CAMP (*Florida Sta. Bul. 227 (1931), pp. 48, figs. 29*).—A general discussion, including information on rootstocks, budding, care of budded trees, top-working and inarching, taking and growing of cuttings, and transplanting of mature trees.

**Native and exotic palms of Florida,** H. MOWRY (*Florida Sta. Bul. 228 (1931), pp. 71, figs. 66*).—A revision of an earlier bulletin and in the same manner presenting general information (E. S. R., 56, p. 538).

**Studies on the reaction of greenhouse soils to the growth of plants,** W. W. WIGGIN and J. H. GOURLEY (*Ohio Sta. Bul. 484 (1931), pp. 30, figs. 7*).—Beginning with a discussion of the soil acidity problem, of methods employed in determining the soil reaction, and the difficulties encountered in maintaining a constant soil reaction in any given plat, the authors present the results of studies with numerous floral crops. In general no specific soil reaction was found essential for the successful growth of most greenhouse flowers, but extremes in either direction were generally detrimental, and with most crops there was an apparent depression in growth near the neutral point, pH 7. Most of the crops preferred a somewhat acid reaction, leading to the suggestion that the promiscuous use of lime as a soil modifier is a questionable practice.

Under conditions of too high alkalinity the growing of certain acid tolerant crops, such as hydrangea, cyclamen, ferns, and cinerarias, was difficult, and aluminum sulfate is suggested as a desirable acidifier, with lime in one of its various forms as a promoter of alkalinity. The color of greenhouse hydrangeas was found affected by the soil reaction in the same manner reported by Connors (E. S. R., 52, p. 143), that is, highly acid soils change the normal pink color to blue. The effects of various fertilizers and crops on the soil reaction are reported.

**Improvement of home grounds in Colorado,** G. BEACH (*Colorado Sta. Bul. 374 (1931), pp. 51, figs. 39*).—General information is offered, with special stress on plant materials and on the planning, planting, and care of the ornamentals about the home.

## FORESTRY

**[Forestry at the New Hampshire Station]** (*New Hampshire Sta. Bul. 256 (1931), p. 17*).—K. W. Woodward reports that thinnings in fully stocked white pine stands between 30 and 50 years old may amount to one cord per acre per annum. Most of the thinnings are utilized as fence posts or cordwood. In species tests red pine, next to white pine, seemed to be making the most satisfactory growth.

**Timber growing and logging practice in the southern Appalachian region, E. H. Frothingham** (*U. S. Dept. Agr., Tech. Bul. 250 (1931), pp. 93, pls. 12, figs. 11*).—One of a series of publications dealing with 12 of the principal forest regions of the United States, this paper presents a picture of the present situation in the region and outlines measures necessary to maintain the forest lands in a productive condition and also suggests methods of management designed to produce full timber crops. Among important steps in keeping lands productive are forest fire prevention, insect control, improved logging practices, and selective cutting with certain species. In the production of full crops it is suggested that a definite cutting schedule should be planned that allows for a reserve of immature timber of different ages to be built up. Burned over spruce land should be replanted and freed when necessary from competing hardwoods. In the farm woodlot the less valuable species should be removed first and livestock excluded from woods that are reproducing.

In the region covered there are approximately 60,771,000 acres of timberland, about 3 per cent of which is nationally owned and 2 per cent under other public control. Further acquisition by public agencies is deemed desirable along with the development of a broad forestry policy in regard to protection, taxation, education, and research. Appended is a list of the common and botanical names of the forest trees in the region. An introduction is given by R. Y. Stuart.

**Forest types in the Southwest as determined by climate and soil, G. A. Pearson** (*U. S. Dept. Agr., Tech. Bul. 247 (1931), pp. 144, figs. 41*).—In the Arizona-New Mexico forest region there are recognized seven broad zones of climate and vegetation known as desert, grassland (including chaparral), woodland, western yellow pine zone, Douglas fir zone, Engelmann spruce zone, and alpine sedge land. Whereas air and soil temperature generally declined with a rise in altitude, precipitation, except for local variations, increased. Wind with its stimulating effect on evaporation increased in intensity with altitude, though often its effect is largely obscured by the forest cover. Evaporation was affected by temperature, low atmospheric humidity, and by exposure.

Soil quality rarely acts as a limiting factor to forest growth in this region, but soil moisture available to growth is conceded important. The soil properties of chief concern to the forester are depth, physical composition, and organic content, the more porous types being the best suited for tree growth. Little difference was found in the ability of species to obtain moisture from the soil, but considerable difference was observed in their ability to extend root growth. In the face of inadequate moisture blue spruce, Douglas fir, western yellow pine, and limber pine reduce their transpiration to practically zero and can exist in such a status for months.

The natural occurrence of species coincided closely with the areas meeting their temperature and water requirements. The upper range of a species was determined by its ability to function in low temperatures and the low range by its ability to resist drought. Apparently if moisture were adequate all indigenous species could descend several thousand feet below their present range.

Winterkilling and frosts are not deemed of general importance in limiting the distribution of the species. Where temperature is too low the limiting feature was apparently too low maxima rather than too low minima.

Light, as regards photosynthetic activity, is not considered a limiting factor in the distribution of species but does have a bearing as respects the production of essential heat.

The author points out that because of the long life of forest trees they demand a greater constancy of favorable conditions than most crops, and that it is highly essential that the forester understand these conditions and work in harmony with them.

**Suitability of brush lands in the intermountain region for the growth of natural or planted western yellow pine forests,** F. S. BAKER and C. F. KORSTIAN (*U. S. Dept. Agr.. Tech. Bul. 256 (1931), pp. 83, pls. 2, figs. 43*).—No significant differences in temperature or total annual precipitation were found between the region in which western yellow pine flourishes and a broad region in northern Utah and southeastern Idaho which at the same altitude is covered with brush. The distribution of rainfall during the summer months was, however, notably different. In the brush land area May rainfall was light, which, coupled with extremely dry June and dry later months, apparently inhibited the establishment of reproduction of western yellow pine. The generally calcareous heavy soils of the brush land area were obviously unsuited for western yellow pine, as evidenced by the encroachment of pine wherever areas of sandy soil or river streams permitted. The fact that certain areas with heavy, fine grained soils were without this species despite adequate rainfall and favorable climate emphasized the importance of the soil factor. Many plants commonly associated with western yellow pine also failed to become established in the brush land.

Other forest species were able to survive on the brush land due, apparently, to lower water requirements for their seedlings or because they grew at a different altitude where rainfall conditions were more favorable. The planting of pine in the brush land area was difficult because of the competing brush and inadequate moisture. The most favorable sites of all for replanting were those on northern exposures and which were covered with deep rooted, thin foliaged shrubs.

In concluding the author states that these brush lands are fundamentally unsuited to the natural reproduction of western yellow pine, and, since established plantations grow slowly and poorly on such areas, there is no jusification for extensive planting operations involving this species.

**Wood-liquid relations,** L. F. HAWLEY (*U. S. Dept. Agr., Tech. Bul. 248 (1931), pp. 35, figs. 14*).—Designed to serve as an introduction to a series of projected publications on various phases of the general problem, this bulletin summarizes the present knowledge of wood structure and of wood-liquid relations. Among conclusions presented are that in the impregnation of wood with liquids the effect of viscosity of the liquid on penetration is as would be expected according to physical laws, but that the effect of pressure on penetration is not what would be anticipated, indicating the existence of other variables, such as, for example, the effect of temperature on the plasticity of the wood. The movement of free water during the drying of wood depends on the size and number of openings between cavities containing water and on the proportions of air and water in these cavities. The need is pointed out for study at an early stage of the principles involved in the problem and the formulation of a tentative hypothesis and of knowing when working with materials such as wood the finest details of structure and to hold them constantly in mind in order to interpret properly experimental data or plan work.

## DISEASES OF PLANTS

**[Plant pathology at the New Hampshire Station]** (*New Hampshire Sta. Bul. 256 (1931), p. 16*).—Healthy and mosaic-infected potato plants grown by O. Butler in the greenhouse under two temperatures, one corresponding to that prevailing in northern New Hampshire and the other similar to that in the southern part of the State, behaved as they would in the field. The diseased plants at the higher temperature showed only mild or obscure symptoms, while at the lower temperature there was conspicuous infection. The healthy stock on the other hand grew much better at the lower temperature. The mean number of tubers per plant was not affected by temperature. The diseased plants yielded better at the higher temperature, while the healthy plants were favored by coolness.

Foliage injury was observed by Butler when the proportion of copper sulfate to sodium carbonate in 1 per cent Burgundy mixture was reduced to as low as 1:0.5. Mixtures of 1:1 and 1:1.5 produced no injury on beans whether exposed to the weather or protected, and a mixture of 1:1.84 caused very slight damage. With apples, increasing the amount of sodium carbonate delayed the onset of injury, though eventually the total amount of damage was much the same for all mixtures except the 1:0.5. A 1 per cent 1:1 Burgundy mixture, acid when first made, became neutral on standing in an open vessel, and the copper precipitate, dense and heavy, was preserved indefinitely by citric or tartaric acid, preferably the former.

**[Plant pathology at the Texas Station]**, J. J. Taubenhaus, W. N. Ezekiel, [B. F.] Dana, W. J. Bach, H. Dunlavy, J. F. Fudge, S. E. Wolff, H. E. Rea, and C. H. McDowell (*Texas Sta. Rpt. 1930, pp. 56–67, 112–115, 146, 147, 152*).—The rapidity of development of cotton root rot was shown in the case of okra plants grown on a cotton root rot free area and inoculated on July 2. By August 10, many of the plants had succumbed and large numbers of new sclerotia in turn capable of infecting cotton plants were found in the soil. In jars of soil in the laboratory sclerotia were produced throughout the year from infected cotton roots. Sclerotia only a week old proved capable of infecting cotton. Sclerotia were found under cotton and beneath infected *Ipomoea trifida* plants at San Antonio.

Attempts at College Station to inoculate healthy cotton with Phymatotrichum spores were unsuccessful. In a number of cases a small percentage of these spores germinated but soon died. In moistened holes in the soil, spore mats developed within 24 hours. A Hydnum found in close proximity to cotton or other susceptible plants dying from root rot was suspected of being the perfect stage of the fungus. However, no resemblance was found in the growth of cultures nor was infection secured when cotton plants were inoculated with Hydnum sporophores. At the Temple Substation it was found that root rot spreads at the rate of from 10 to 18 ft. per year. As indicated by the cotton plant top, root rot spread was retarded when the soil temperature dropped below 70° F. Evidence from soil reaction studies at College Station indicated that it would be possible to control root rot in soils low in lime by applying sulfur, though the methods and amounts are uncertain.

Preliminary studies showed that the Phymatotrichum fungus can be grown on synthetic media in which the sources of both nitrogen and carbon are purified compounds. The sclerotial stage was also developed readily. In general, sclerotia developed most freely in the media which favored the heaviest vegetative growth. The generally accepted conclusion that monocotyledonous plants are resistant to root rot was sustained in observations on corn and cotton growing in alternate hills in heavily infested soil. The cotton alone succumbed. Lesions on roots of corn, sorghum, and Johnson grass failed to yield root rot. Other monocots such as canna, caladium, date palm, gladiolus, and onion were not infected in a heavily infested area. Certain plants apparently resistant in nature succumbed upon inoculation, suggesting that their resistance was due to isolation. Various susceptible weeds extend their roots to a depth of several feet, thus accounting for deep infestations.

At Weslaco Substation, the Champanel, Mustang, Black Spanish, and *Vitis champinii* grapes continued to show resistance to root rot. No sour orange seedling was killed by inoculation, suggesting the value of this species as a rootstock. A list is given of several other plants which showed resistance.

In the laboratory, a mixture of sulfur and soil served as an effective barrier in stopping the spread of root rot, and in the field a plat of sorghum was effective. Some of the organic mercury compounds showed value as disinfectants.

Cotton root rot studies at Weslaco Substation showed unusual resistance in the Turk's-cap hibiscus. Sesbania proved resistant, and among four species of Crotalaria, *C. incana* was the only one to show resistance. The carrot was the only vegetable to suffer severely from root rot. An unusual amount of gummosis and scaly bark was found in a 10-year-old grapefruit grove. At Iowa Park Substation, certain alfalfa strains which heretofore had shown resistance to root rot became highly infected.

Cotton root rot investigations conducted at the Temple Substation, where the soil is heavily infested, showed in the deep Houston black clay soils viable sclerotia existing in great numbers, intermingled with large numbers of partially disintegrated and nonviable sclerotia and distributed through the soil from plow sole to a depth of 24 in. Sclerotia in one location survived 30 months of fallowing. Strand sclerotia were present to a very limited extent in the deep Houston soil but were very numerous in the shallow type of Houston clay in the 12 to 15 in. zone. The strand sclerotia were used successfully in inoculating cotton. The development of spore mats in the strand sclerotia zone suggested a relationship between these structures and the Phymatotrichum stage. Sclerotia found in large numbers at depths of about 5 in. in prairie grass associations are believed to be associated with the roots of dicotyledons but not with the grasses.

Sclerotia and strand sclerotia produced in the laboratory were successfully used in transferring the disease to cotton. The range from 21 to 27° C. proved most favorable for sclerotia production. Mycelium developed at 38° but with no sclerotia. Sclerotia formed as freely in light as in darkness, and in small percentages retained their viability after 58 days under water. Infected soil was air dried for 51 days without killing the sclerotia. Dipping in solutions of sodium and calcium chlorate as weak as 0.125 per cent devitalized sclerotia, whereas 1 lb. per gallon killed the fungus on cotton roots.

Soil temperature readings taken daily throughout the year showed in winter some retardation in growth at 4 ft. and in spring an acceleration at the same depth. Houston black clay maintained a more uniform moisture content and with it a more constant degree of infection throughout the year than did Houston clay.

Attempts were made to isolate resistant cotton plants. Seed of 18 lots showing no infection were saved for further trial. Some indication was observed that deep tillage in autumn reduced the infection the following year. Fertilizers of different composition had no effect on root rot. A total of 623 species of plants were found susceptible to root rot disease, and studies were made of some of these to determine their rôle in dissemination. Two years of fallow failed to decrease root rot obviously due to the sclerotia. Delinting cottonseed with sulfuric acid increased the stand 15.8 per cent, and treatment with Ceresan 20.3 per cent.

Fusarium wilt of tomatoes was found to occur on a number of soil types ranging widely in acidity, indicating a broad adaptability of the fungus or else the presence of numerous strains. Puffing of tomatoes, found to occur on all types of soil, under varied weather conditions, and in all varieties tested, is suspected to be due to an inherent weakness in the tomato rather than any disease. Core rot, a trouble frequently accompanying puffing, was traced to two unnamed bacteria. Spraying in the field is suggested as a remedy. Charcoal rot, a disease which blackens the whole tomato, was caused apparently by a fungus closely resembling *Sclerotium bataticola*, a pathogene of the sweetpotato and some other plants. *F. solani* caused serious damage to late-planted spinach.

At Weslaco Substation, sulfur in any form proved highly injurious to the leaves and stems of cantaloupe. Neutral Bordeaux mixture gave very good results. At College Station, placing sulfur upon the soil close to the vines caused no injury and at the same time apparently controlled downy and powdery mildews. Kolodust, because of adhesive properties, proved more effective than sulfur in controlling mildews, and three applications of this material practically controlled carnation rust in a badly infested house.

**Physiologic specialization in Fusarium spp. causing headblight of small grains,** C. Tu (*Minnesota Sta. Tech. Bul. 74 (1930), pp. 27, figs. 5*).—In a comparative study of 10 different forms of fusaria attacking cereals, evidence was found that there are three physiologic forms of *Fusarium graminearum*, three of *F. culmorum*, and two of *F. avenaceum* that can be differentiated by their parasitism on varieties of cereals. The two physiologic forms of *F. avenaceum* had different temperature requirements, about 27° C. in one case and about 22° in the other, when grown on Difco potato-dextrose agar. The optimum temperature for three physiologic forms of *F. graminearum* and three of *F. culmorum* and its mutant was 27°, for *F. nivale* an optimum of about 22°, and for *F. solani* about 32°. There were also differences in pathogenicity for the several species of Fusarium studied. The physiologic forms of *F. graminearum*, *F. culmorum*, and *F. avenaceum* differed in their capacity for alcoholic fermentation. *F. culmorum* form 1 developed on cultural media a mutant type which differed both culturally and pathogenically from the parent. Evidence was seen that initial head infection is by way of the glume rather than through the anther.

**Preliminary studies of the enzymes of Gibberella saubinetii,** G. Spitzer and M. M. Diehm (*Jour. Agr. Research [U. S.], 43 (1931), No. 3, pp. 223–229*).—In this contribution from the Indiana Experiment Station, a cultural medium consisting of 4 per cent malt extract and 0.2 per cent nitrate of soda was used for growing the cereal scab organism, which was then tested for activity on the substrates amygdalin, salicin, sucrose, hydrogen peroxide, olive oil, casein, gelatin, urea, starch, and cellulose. The glucosides amygdalin and salicin were actively hydrolized, indicating the presence of glucosidase. A rapid hydrolysis of sucrose indicated the presence of invertase. The enzyme material showed a decided catalase reaction. The action on olive oil was weak but sufficient to indicate the presence of lipase. Casein was hydrolized readily at pH 9 and pH 6 but not at pH 3, suggesting the presence of proteolytic enzymes, especially trypsin and erepsin. The results with gelatin agreed in general with those for casein. No positive results were obtained for urease, amylase, and cellulase.

**Cotton root-rot and its control,** J. J. TAUBENHAUS and W. N. EZEKIEL (*Texas Sta. Bul. 423* (*1931*), *pp. 39, figs. 8*).—A general discussion is presented of the nature, distribution, and control of root rot (*Phymatotrichum omnivorum*), found in at least 196 counties of Texas and in at least 30 soil series. The disease attacks a large variety of plants, including field crops, vegetables, fruit trees, and ornamentals, but not the monocots, including grasses and grains.

The vegetative strands of the fungus occur on the diseased roots, and the spore-mat stage is found on the soil surface above the affected roots. Sclerotia, or resting bodies, formed in the soil near the diseased roots, aid in the survival of the fungus. The spread from plant to plant takes place chiefly along roots rather than by independent growth through the soil. Hibernation occurs in living though infected roots of susceptible plants, the spread continuing even after the tops have been frozen. In a dormant condition the fungus overwinters as sclerotia.

Control consists in rotation of susceptible with nonsusceptible plants accompanied by clean culture through the entire period needed of at least the three years the sclerotia survive. Other possible control measures still in the developmental stage include the acidification of the soil, the use of disinfectants, the growing of resistant varieties of susceptible species, and various cultural treatments.

**Experiments with the tuber index method of controlling virus diseases of potatoes,** J. E. KOTILA (*Michigan Sta. Tech. Bul. 117* (*1931*), *pp. 26, figs. 11*).—Presenting a general discussion of the tuber unit index method of testing potato seed stock and the method of increasing selected stocks, the author gives the results of yield trials of tuber unit stocks. No significant differences were observed in the yielding capacity of different clons of a given variety, and under the favorable conditions of the Upper Peninsula no appreciable differences were found between the yielding ability of clons of early and late varieties. The chief factor in the maintenance of healthy seed stocks is the location of the increase plats in a region favorable to potato growth. Certain of the clons were increased to the extent that over 9,000 bu. were certified in 1929.

**Increasing soil acidity as a means of controlling black root-rot of tobacco,** W. L. DORAN (*Massachusetts Sta. Bul. 276* (*1931*), *pp. 117–146, figs. 2*).—Of various acidifying agents tested as means of increasing the acidity of the soils and thereby decreasing the losses due to black root rot (*Thielavia basicola*) of tobacco (E. S. R., 62, p. 444), sulfur and sulfur compounds were found highly effective. Nitric acid lowered pH but was decidedly toxic to the tobacco. Orthophosphoric acid used alone reduced pH but had no beneficial effect. Aluminum sulfate reduced the injury caused by the fungus, leading to the assumption that salts of aluminum instead of or in addition to H-ion concentration inhibit black rot in acid soils and that orthophosphoric acid or lime inactivates the inhibiting influence.

Lime applied in 1923 was still sufficiently potent in 1930 to maintain the pH above 5.9. Losses indirectly traceable to lime applied in 1923 reached their maximum, about 44 per cent, in 1925 and 1926, thereafter decreasing to about 24 per cent in 1929 and 1930. Lowered yields on limed plats were associated with poorer quality. In 4 of 6 years lime did not increase fire-holding capacity of the leaf, but rainfall was a factor.

Tobacco and alfalfa were equally efficient in removing calcium and magnesium oxides from limed soils, but without the aid of sulfur or acids neither lowered the pH value. Timothy was much less effective in removing the oxides, and since brown root rot increased following timothy, hay is not deemed a desirable crop in the tobacco rotation. Alfalfa grown in limed soils infested with Thielavia did not become infected.

The severity of black root rot was lessened by sulfur or acids as much or more so the year applied as later. Yields of tobacco on limed plats infested with black root rot were increased the first year by all acidification treatments. Sulfur applied to unlimed plats free from rot either increased yields or had no effect. On limed plats sulfur increased yields more the second year. On the soils utilized, 400 lbs. of sulfur per acre was a desirable application. Increased yields from acidification were generally accompanied by increased percentages of leaves of the light to medium and second grades.

**Late blight of tomatoes and potatoes,** J. J. Taubenhaus and W. N. Ezekiel (*Texas Sta. Circ. 60 (1931), pp. 15, figs. 5*).—A general discussion is given upon the nature, distribution, importance, and control of this disease, hitherto unimportant in Texas, but in 1931 epidemic in the lower Rio Grande Valley. Spraying with Bordeaux mixture or dusting with copper-lime materials gave excellent field control.

**Tomato late-blight rot, a serious transit and market disease,** G. B. Ramsey and A. A. Bailey (*U. S. Dept. Agr. Circ. 169 (1931), pp. 11, figs. 6*).—This is a general discussion of the disease, its geographic distribution and economic importance, relation of weather conditions to its occurrence, development in transit, and control measures. Although the amount of decay developing in transit may be greatly reduced by immersing the fruits in a formaldehyde solution, the treatment is deemed impracticable because of costs. A spray program in the field is considered much more feasible, and either 4-4-50 Bordeaux mixture or copper dust applied in a schedule such as used on potatoes is recommended.

**Gray mold of tobacco,** F. A. Wolf (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 2, pp. 165–175, figs. 5*).—Gray mold, tentatively identified as *Botrytis cinerea*, is in North Carolina mainly a disease of tobacco seedlings before transplanting. The lower leaves are attacked first, the pathogene passing thence into the stem, where dark, sunken, necrotic spots are formed. Girdling sometimes follows, with the death of the plant in the bed or shortly after transplanting. Characteristically, all affected parts are covered by a gray moldy coating.

Outbreaks in 1928 and 1929 occurred during rainy periods when the temperature ranged between 68 and 85° F. during part of the day. The year 1930 with its drought and high temperatures proved unfavorable to the disease. As a practical suggestion, it is deemed advisable to locate seed beds on well-drained and well-aerated slopes.

**Further studies on tobacco ring spot in Virginia,** R. G. Henderson and S. A. Wingard (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 3, pp. 191–207, pls. 7*).—In this contribution from the Virginia Experiment Station, ring spot, a virus disease of tobacco reported from a large number of leading tobacco districts throughout the world, was found to live naturally in Jimson weed and cantaloupe. Viruses occurring in sweetclover, yellow ironweed, petunia, and squash produced ring spot symptoms of lesser intensity and are believed to be attenuated forms of the same virus. The ring spot disease did not survive the winter in the roots of the pokeweed.

Ring spot virus was killed by temperatures between 60 and 70° C., but remained infectious in expressed juice exposed to subzero temperatures for 22 months. The virus was readily inactivated by drying. Under greenhouse conditions, ring spot persisted for more than a year in the juice of tobacco plants propagated by cuttings, despite the fact that the symptoms remained masked the entire period. Artificial inoculation showed tobacco leaves of intermediate age to be most susceptible. Infection was produced in tomato plants by grafting. Although the disease was readily transmitted through the seed of petunia, little evidence was found that such is true in tobacco. Artificial inoculation produced ring spot in the potato, but the virus occurring naturally in the potato is deemed entirely distinct.

Ring spot virus was precipitated and separated from expressed juice with either alcohol or acetone and recovered in water without any applicable lessening of its infective properties. Virus passed through a Berkefeld filter of the W grade if the juice was first cleared of suspended solids. Ring spot virus was infectious when diluted as much as 1 to 1,000, but only a trace of infection was observed with the 1 to 10,000 dilutions.

**Arsenical and other fruit injuries of apples resulting from washing operations,** D. F. FISHER and E. L. REEVES (*U. S. Dept. Agr., Tech. Bul. 245 (1931), pp. 12, pls. 3*).—In connection with descriptions and discussion of various types of injury induced in apples by arsenical residues and by chemicals used in removing the residue, means of preventing these injuries are outlined. Arsenical injury to the calyx end of the apple was found to be accentuated by washing, if following the treatment the fruits were not carefully rinsed in clean water or if they were stored before drying under conditions of inadequate ventilation. That calyx injury was due to arsenicals was indicated in a high content of arsenic in the injured tissues. Furthermore, similar injury was produced on arsenic-free Winesap apples by dipping them in solutions of arsenic pentoxide and storing them without rinsing or drying. Many washed apples found in storage with severe arsenical injury in the calyx yielded less than 0.01 grain of arsenic per pound of fruit. The rinse water was found to accumulate a rather high content of arsenic during a day's use, suggesting the need of frequent change. Lime added to the rinse water reduced the toxicity of the dissolved arsenic.

Hydrochloric acid injury, manifested in bleached skin with frequent cracking, was extremely rare when apples were properly washed and rinsed. Alkaline washes, such as sodium hydroxide, borax, etc., were more difficult to remove by rinsing than was hydrochloric acid and frequently reacted with the residual arsenate in the calyx or stem end to form soluble arsenic with resulting injury. Apple varieties with open calyx tubes were more subject to core injury than those with closed tubes.

Washing solutions heated to 100° F., or more, caused injury to apples allowed to remain therein for more than three minutes.

In conclusion the authors point out that if washing is done with proper equipment and due care, neither market value nor keeping quality will be impaired and they may be actually enhanced.

**Control of Botrytis rot of pears with chemically treated wrappers,** J. S. COOLEY and J. H. CRENSHAW (*U. S. Dept. Agr. Circ. 177 (1931), pp. 10, figs. 5*).—Botrytis sp. (apparently *B. cinerea*) causes a serious storage rot of apples and pears which may spread even in the case of paper-wrapped fruits from the diseased to the healthy specimens. However, in experimental trials the authors found that the spread of the Botrytis fungus could be checked by the use of wrappers impregnated with a 2.5 per cent solution of copper sulfate, the dry wrapper carrying about 1.4 per cent of its dry weight in metallic copper in the form of copper sulfate. Oiled paper wrappers impregnated with copper sulfate were also effective in preventing the spread of the disease.

Excessive sweating of pears or packing fruit while wet may cause the development of black spots due to copper injury. Analysis of pears that had been packed with wrappers treated with 10 per cent copper sulfate and held four months in cold storage showed only a trace of copper, far below the expected tolerance.

**Field observations on strawberry dwarf,** N. E STEVENS (*U. S. Dept. Agr. Circ. 174 (1931), pp. 8, fig. 1*).—Asserting that the dwarf disease is by no means new and is recognized in the South under various localized names, the author describes a diseased plant and discusses the early literatue, the cause, importance, distribution, behavior of affected plants, and methods of control.

**Control of strawberry leaf blights in Louisiana,** A. G. PLAKIDAS (*Louisiana Stas. Bul. 225 (1931), pp. 21, figs. 5*).—Strawberry leaf spot (*Mycosphaerella fragariae*) and leaf scorch (*Diplocarpon earliana*), the symptoms of which are herein described, were almost completely controlled by applications of 4-4-50 Bordeaux mixture every 10 days from the first week in January to the first week in March. Three sprayings, January 8 and 18 and February 1, gave only partial control. Yield records taken in 1930 and 1931 showed great differences in favor of spraying, a gain of 64+ per cent in 1930 and 100+ per cent in 1931. Spraying apparently stimulated growth as well as controlling the diseases. Bordeaux mixture did not injure open blooms nor interfere with pollination. The addition of 1 pt. to 1 qt. of ammonia per 50 gal. of spray had no beneficial effects.

Using pure cultures of both organisms it was found that both had relatively wide ranges of effective growth temperatures, scorch growing best at from 62 to 70° F., and the leaf spot between 63 and 72°. In inoculations heavy infections of *M. fragariae* were secured from November to May and of *D. earliana* from May to November.

**Control of "damping-off" of flower seedlings,** P. E. TILFORD (*Ohio Sta. Bimo. Bul. 152 (1931), pp. 167-175, figs. 2*).—Semesan applied to the seed of several species of flowers either as dust or in solution did not prove a satisfactory control for damping-off and was of no benefit to the seedlings after emergence. In fact certain species were injured by this material. On the other hand formaldehyde dust made by impregnating some absorbing material, such as infusorial earth or dried muck, with commercial formalin, gave when mixed with the soil excellent control of damping-off both before and after emergence. Formaldehyde treatment delayed emergence for from 24 to 48 hours, but this handicap was soon overcome.

**The Dutch elm disease,** C. MAY and G. F. GRAVATT (*U. S. Dept. Agr. Circ. 170 (1931), pp. 10, figs. 6*).—A brief account is presented of a new disease, first discovered in the United States in 1930, which is deemed to constitute a serious threat to the American elm. Information is given as to the distribution, susceptible species, symptoms, manner of spread, the causal organism, methods of control, etc.

**Longevity and germination of seeds of Ribes, particularly R. rotundifolium, under laboratory and natural conditions,** A. E. FIVAZ (*U. S. Dept. Agr., Tech. Bul. 261 (1931), pp. 40, pls. 5, figs. 2*).—Seeds of certain species of currants and gooseberries, particularly *R. rotundifolium*, were observed to accumulate in the forest litter, remaining dormant for long periods and germinating shortly after various disturbances, such as ground fires, logging operations, windfalls, etc. That germination was dependent on soil cover disturbance rather than light change was evident in germination under heavy canopies when the mineral soil was exposed.

In laboratory tests, seeds of *R. rotundifolium* and *R. cynosbati* germinated more abundantly and promptly when subjected to a daily alternation in temperature than when held at a constant temperature. A daily alternation of from 10 to 25° C. was most effective. The author believes that the rather constant temperature on the forest floor is a factor in maintaining the dormancy of Ribes seeds. Furthermore, since germination was more prompt and abundant in peat neutralized with calcium carbonate than in natural peat, the author believes that soil reaction is also a contributing factor.

From the viewpoint of blister rust control the practical deduction is reached that forest floor disturbances such as are caused by fires should be kept at a minimum where Ribes seeds are present.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Officials and organizations concerned with wild-life protection, 1931,** compiled by F. G. GRIMES (*U. S. Dept. Agr., Misc. Pub. 122 (1931), pp. 13*).—This, the thirty-second annual directory (E. S. R., 64, p. 153), follows the same general form as the previous editions.

**[Work with economic insects at the Texas Station]** (*Texas Sta. Rpt. 1930, pp. 32–41, 87–89, 147–149*).—In studies conducted by H. J. Reinhard with a view to determining how and where the boll weevil secures its fatal dose of poison on cotton plants dusted with calcium arsenate, 87 individuals were under continuous observation for periods totaling approximately 111 hours. It was found that the distance crawled by weevils on the poison-free plants was more than 3.5 times greater than that crawled upon the dusted plants. The travel of the weevils on cotton plants dusted with calcium arsenate was greatest on the foliage, with approximately the same distance crawled on the upper and lower surface of the leaves. More than 55 per cent of the total distance crawled occurred on the leaves, 37 per cent on the stems, and nearly 7 per cent on the fruits and remainder of the plant. A summary of the percentage of survival for the hibernation years 1924-25 to 1929-30, inclusive, is given in tabular form.

A study of the cotton flea hopper by Reinhard and F. L. Thomas failed to show any nymphs to be distributed by the wind, although many adults thus carried were captured by means of screens and nets. Fewer cotton flea hoppers were found by Reinhard and J. C. Gaines to emerge from overwintering eggs on croton weeds during the spring of 1930 than any year since 1926, when the hibernation records were first recorded. The effective mean minimum temperatures during February and March were sufficient to cause practically 37 per cent of the hoppers to emerge before cotton was up to a stand in the field. Although approximately 58 per cent of the total emergence of the hoppers occurred during April, the numbers were insufficient to produce any severe or widespread damage to the crop. A summary is given in tabular form of all available hopper emergence records from 1926 through April, 1930.

Preliminary work on the hibernation of the pink bollworm by [F. A.] Fenton and W. L. Owen, jr., in cooperation with the U. S. D. A. Bureau of Entomology, conducted at Presidio during the winter of 1928–29, is reported upon. They found that in adobe soil, where by far the greater emergence took place, it increased daily throughout April and reached its peak May 11; then there was a rapid decline until June 15, after which date a few late moths emerged up to August 14. In sandy soil the emergence reached its peak April 27 and the last moth emerged June 16. Boll infestation by this pest appeared a month earlier in 1929 than in the preceding year and was the heaviest observed since 1925, when the records were first kept. At Castolon, where a noncotton zone had been maintained in 1928, the first infestation was observed by the middle of

September, 1929. Square examinations were found to be very unreliable as a means of detecting an early infestation. In night sweepings made in four fields at Adobes, Indio, Ochoa, and La Junta, respectively, which were commenced September 12, the total number of moths collected was small but showed steady increases until a high first peak was reached September 26 and 28, with a second and highest peak October 8.

In biological studies of the pink bollworm the longevity of the moths after fruiting of cotton was greatly influenced by temperature, with an average of 12.13 days for females from seeds and 11.11 days for males from seeds. For boll material the average was 19.1 for females and 11.95 for males. The maximum longevity recorded was 37 days for females and 31 for males. The average preoviposition period was found to vary from 3.7 days for October to as long as from 12 to 13 days in late October and early November. The greatest number of eggs were laid during the first 3 days of oviposition. The threshold of activity for the moths appears to be around 60° F. Eggs were laid on or in the soil as well as on all parts of the cotton plant. In the field 94.4 per cent of the eggs on the plant were found under the boll bracts. The maximum fecundity of the moth noted was 323 eggs. The length of the incubation period was greatly influenced by temperature. The greatest number of records was 4 to 5 days at mean temperatures of 83°, with a range from 70 to 86°. The developmental zero for the eggs was about 58.4°. In the insectary in August the time elapsing between oviposition and exit of mature larvae from bolls averaged 13 days, from egg to moth emergence 26 days. In September the averages were 16 days and 36.9 days. In the field cages the period from egg of one generation to that of the following averaged 30 days. The length of the pupal stage ranged from 7 to 26 days, the latter period being exceptional. Average temperatures as low as 26.33° for 8 hours do not kill the moths. Moths are attracted to electric lights of from 75 to 100-watt power in fairly large numbers, the males being much more strongly attracted than the females. There were four field generations at Presidio.

In cultural control work with the pink bollworm at Presidio, carried on in cooperation with the U. S. D. A. Bureau of Public Roads, the combination of plowing immediately followed by irrigation gave the greatest kill regardless of when these operations were carried out, provided the irrigation was done within a few days after the plowing. The attempted introduction of the parasite *Microbracon kirkpatricki* from the Sudan failed due to the inability to rear the adults.

In work with the cotton bollworm by Thomas an average yield of 1,135 lbs. of seed cotton per acre was obtained on plats where calcium arsenate was used as compared with 135 lbs. per acre in plats where no dust was applied. An analysis of the work emphasizes the importance and necessity for timely application in controlling the cotton bollworm, eight applications having been made, the first five of which were responsible for about 900 lbs. of the increase in yield.

In control work with the cotton flea hopper in the Lower Rio Grande Valley in May and June, Gaines and S. E. Jones found four applications of sulfur to give an increase in 27 days of 36 per cent more forms on the dusted plats than on the untreated plats. In combating the pest on a farm at Navasota, sulfur was successfully applied by airplane. From the 42 per cent of the plants infested when the dust was applied there was a reduction to 7.2 per cent in 4 days.

A single application of arsenate of lead (3 lbs. to 50 gal. of water) made by S. W. Bilsing on May 8 for the control of the pecan nut case bearer reduced the infestation of from 85 to 100 per cent to about 15 per cent infestation.

In apiary inspection work only a little more than 1 per cent of the 38,000 colonies kept by 735 beekeepers was found by C. E. Heard to be infected with American foulbrood.

Work at the plant lice laboratory in Galveston County, established chiefly for the purpose of studying plant lice on truck crops, was conducted by J. N. Roney. Of these, the turnip aphid causes the most injury. The root louse *Pemphigus populi-transversus* Riley, which leaves its leaf stem galls on the cottonwood early in October and appears on truck plantings, makes its way to the roots, causing them to split and in many cases killing the plants. The small predacious bug *Anthocoris muscular* Say was found in August destroying the lice in 40 per cent of the cottonwood leaf galls. Brief mention is made of work with the small beetle *Carpophilus dimidiatus* Fab. which attacks the ripening fruit of figs, causing it to sour, and is known locally as the sourbug.

The beekeeping investigations conducted at the apicultural research laboratory near San Antonio, and at outyards located near Dilley, Roxton, and Seguin, are briefly reported upon under the headings of behavior of bees, honey plants, queen breeding, bee products, bee relationship, distribution of honey production, and horsemint for honey production and for oil.

In work with honey plants, 2,000 of the insect visitors to these plants were captured and labeled for study. "It was found that *Thrips prosopii* outnumbered and drove away the honeybee from mesquite, that the yellow soldier beetle (*Chauliognathus marginatus*) drove away bees from horsemint and mesquite, and the tachinid fly *Archytas analis* drove the honeybee away from sweetclover. Apparently, introduced honey plants are seldom visited by insects during the first few years of their introduction. On the other hand, the honeybee visits the introduced plants more often than the native plants. Native honey plants have a higher percentage of native insect visitors than introduced plants. The honeybee is a competitor of the native bee only in the spring and fall of the year, when they monopolize the plants in bloom. During the large part of the honey-plant season, honeybees work the plants for nectar only in the early morning and late afternoon. The native bees work the same plants during the hot part of the day."

The cultivation of horsemint for honey production and for oil was carried on during the year, two species, *Monarda citrodora*, native to the Blacklands of Texas, and *M. punctata*, the horsemint of the sandy lands, being grown. Eight years of work indicate that during poor years the mint will justify cultivation, and that in normal or wet years the wild mint will yield a larger number of pounds.

Work conducted by S. W. Clark at the Weslaco Substation in the Lower Rio Grande Valley is reported upon. The severe winter apparently had little effect on the mortality of the California red scale, which continues to be a pest of primary importance to citrus, the mortality being nearly normal at 84.2 per cent. It was found that two summer applications of an oil emulsion made of an oil of low volatility was decidedly superior to single-summer applications. Applications in May and July gave better control than did those made in June and August. The California red scale is said to live and produce young during warm periods throughout the whole winter, a temperature of 22° for a short period neither killing nor interfering with reproduction except for a period of 3 days immediately following this temperature. The total length of life for the fall period varied from 132 to 253 days with an average of 191 days, the winter period 114 to 261 days with an average of 210.3 days, and the spring period 101 to 284 days with an average of 159.4 days. The average time required for maturity under valley conditions was 52.7 days in the fall, 110.3 days in the winter, 73.1 days in the spring, and 44.8 days in the summer.

The species of thrips present on citrus in the valley in the spring of 1930 in extraordinary abundance was identified as *Thrips californica* Moulton. No apparent damage was caused to grapefruit by its infestation. Applications of sulfur dust apparently had no effect on its control.

An application of lime sulfur applied in early April controlled the citrus rust mite effectively for nearly 60 days. The red spider is becoming of more importance in citrus production, and it is thought that where single applications of oil are made the application of sulfur may become necessary in its control.

It is pointed out that fire ants infesting citrus trees may be effectively controlled by the use of cyanide dust. Truck crop pests briefly mentioned include the striped blister beetle (*Epicauta lemniscata*) on tomatoes, which was controlled by the use of sodium fluosilicate and lime 1 to 1; the tomato suck fly (*Dicyphus minimus*), effectively controlled by a single application of sulfur dust; and the cabbage aphid, controlled by the application of nicotine sulfate (1 pint) and fish oil soap (4 lbs. to 100 gal. of water) applied under high pressure.

**Experiments for the control of the San Jose scale with lubricating-oil emulsions in the Pacific Northwest,** E. J. Newcomer and M. A. Yothers (*U. S. Dept. Agr. Circ. 175 (1931), pp. 12, fig. 1*).—In work conducted at Yakima, Wash., in 1923, 1924, 1925, and 1927, the authors found that in order to obtain a satisfactory control of the San Jose scale in the Pacific Northwest, in many parts of which it has been gradually increasing until the consequent loss of fruit has become very noticeable, lubricating oil sprays must be used at a dilution containing 4 per cent of oil. "This dilution only allows a fraction of 1 per cent of the scale to live, while complete mortality may be obtained with 6 and 8 per cent dilutions. It is considered probable that the 3 per cent dilution would be effective if the infestation of the scale were very light. Dilutions containing only 2 per cent of oil do not give satisfactory control. When used at 3 or 4 per cent there is practically no difference in the effectiveness of oils of the red engine and of the brown neutral types, even though the latter oils are lighter. Oils with a sulfonation test of 50 to 70 per cent may be used safely. The three types of oil sprays tested—the cold-mixed caseinate oil emulsion, the boiled emulsion, and the miscible oil—gave very similar results.

"The boiled emulsion, made with soap, is readily broken down in hard water, and its use can not be recommended in the Pacific Northwest unless soft water is available. The miscible oil mixes very well with most hard waters. The boiled emulsion and caseinate emulsion may be made very easily, but the manufacture of miscible oil should not be attempted by the grower unless a cresol-soap emulsifier can be obtained. Satisfactory miscible oils and oil emulsions are on the market which may be used in place of the homemade materials, and in most cases these will be safer and more economical.

"The addition of casein spreader to the diluted caseinate emulsion apparently neither increases nor decreases its effectiveness against the San Jose scale. The addition of weak lime sulfur to the caseinate emulsion increases its toxicity, a complete mortality resulting from a 2 or 3 per cent oil emulsion to which this has been added. This combination should be used only on dormant trees, as it is very likely to burn the foliage. An oil emulsion containing coconut fatty acid is also evidently more toxic than one without."

**The feeding habits of some leaf hoppers of the genus Empoasca,** F. F. Smith and F. W. Poos (*Jour. Agr. Research [U. S.], 43 (1931), No. 3, pp. 267–*

*285, figs. 18*).—This contribution reports upon a study made of the external symptoms produced on the plant and of the particular tissues fed upon by six species of Empoasca. On the basis of the results obtained in the study the species are divided into two groups. The first group, which includes *E. maligna* Walsh, *E. abrupta* DeL., *E. flavescens* DeL., *E. bifurcata* DeL., and *E. erigeron* DeL., is characterized by a habit of feeding on the mesophyll tissue of the leaves and the regular production of definite spotting or stippling on the upper surface. The more mature foliage seems to be preferred to that of the more succulent, younger leaves. Members of the second group, which is composed of two strains of *E. fabae* (Harr.), evidently feed by preference upon the phloem or water-conducting tissue, and the well-being of this species seems to depend upon the availability of fresh phloem tissue in succulent plant parts.

When *E. fabae* is confined to mesophyll tissue, and the mesophyll-feeding species of the first group are confined to succulent phloem tissue on growing tips and petioles, all die within a short time. These differences in feeding habits seem to be correlated with the physiology of the species. The feeding by *E. fabae* in the phloem tissue or xylem vessels results in more serious injury to the host plant than does the feeding by an equal number of individuals of the other species of Empoasca on the mesophyll tissue. No evidence was found that a toxin was introduced into the plant by any of the species. On the contrary, the present studies indicate that injury by *E. fabae* is the result of interference with translocation of plant materials which produces either wilting when xylem vessels are plugged or yellowing or reddening when the phloem is disorganized and plugged.

**The wheat field survey—1931,** J. S. Houser (*Ohio Sta. Bimo. Bul. 152* (*1931*), *pp. 163–167, figs. 2*).—This is a continuation of the wheat field surveys made annually at the time the wheat is ripening to serve as a census of the status of the Hessian fly and other wheat pests (E. S. R., 63, p. 851).

In 1931 the average infestation of the Hessian fly, based on data obtained from the 19 counties surveyed, was 12.2 per cent, or nearly double that of 1930, but varied from 3 to 33.4. A map is given showing the Hessian fly-free seeding dates, and the importance of carefully adhering to these dates is emphasized.

**Life history of the codling moth in the Rogue River Valley of Oregon,** M. A. Yothers and E. R. Van Leeuwen (*U. S. Dept. Agr., Tech. Bul. 255* (*1931*), *pp. 35, figs. 18*).—The account here given is one of a series reporting life history studies of the codling moth in different parts of the United States. The data presented, the details of which are given in tabular and chart form, show that there are two complete generations and a partial third in the Rogue River Valley of Oregon. The time of appearance and the periods of occurrence of the different stages of the codling moth for the years 1918 to 1922, respectively, are graphically illustrated. The curves shown in the figures represent approximately the beginning, height, and end of activity of the more important stages of the insect, together with the approximate rate of development during the period covered. A summarized account of the beginning, maximum, and end of the more important biological stages for this period is given for the purpose of a comparison of the seasonal history of these years. A summary of its life history in the Rogue River Valley is given in graphic form.

**Biological studies of the oriental fruit moth, 1930,** C. O. Eddy and W. C. Nettles (*South Carolina Sta. Bul. 278* (*1931*), *pp. 21, figs. 6*).—This report of the work conducted by the station in 1930 supplements the accounts of the oriental fruit moth previously noted (E. S. R., 64, p. 652). The work was extended during the year to include its biology, parasitism, and control. A study of infestation in twigs based upon three orchards in the western Piedmont section and five in the sand hill section is reported in chart form, the averages for the two sections having been plotted. It appears that the infestation in the western Piedmont was consistently much higher than in the sand hill section, but that the general trend of increase and decrease was quite similar in the two areas.

Data on the life history studies are presented in tabular form. The incubation period of the egg was found to range from 3 to 9 days, with an average of 4.64 days; the feeding period from 7 to 18 days, with an average of 12.31 days; the cocooning period from 1 to 17 days, with an average of 4.91 days; and the pupal period from 5 to 14 days, with an average of 9.01 days. These data are for transforming larvae only. The longevity of the adults from the middle of August up to October 21, recorded by 15-day periods, was found to average from 15.9 to 22 days for the female and 1.5 days less for the male. From 15 to 92.8 eggs, with an average of 56.08, were laid by the females during their life. The preoviposition period averaged 3.46 days, the oviposition period 13.08, and the postoviposition period 6.77.

One of the largest collections of larvae and pupae from burlap bands placed on late ripening varieties was made September 8, a total of 25 larvae and pupae having been taken from a single band placed on a Dulce tree. The week previously 13 larvae and pupae were collected from the same tree. The seasonal history of the oriental fruit moth is shown in detail in chart form. The introduction of the larval parasite *Macrocentrus ancylivora* Roh. from New Jersey and its rearing and distribution are described. In briefly referring to the egg parasite *Trichogramma minutum* Riley it is stated that in 1929 about 50 per cent of the eggs were parasitized by it during the crest of egg laying. During that year and 1930 parasitism by it did not become an important factor in crop protection until after the Elberta crop was harvested.

An annotated list is given of 15 species of parasites reared in the State from the oriental fruit moth in 1930, 2 of which remain to be described.

**Observations on the satin moth and its natural enemies in central Europe,** R. C. Brown (*U. S. Dept. Agr. Circ. 176 (1931), pp. 20, fig. 1*).—In observations made in central Europe, with headquarters at Budapest, Hungary, the satin moth was found to feed exclusively on poplar and willow. These trees are widely distributed throughout central Europe, being planted mainly for ornamental and shade purposes. *Populus nigra italica* and *P. nigra* are the most common of the poplars, and by far the most favored food plants. Development of the larvae was found to be distinctly retarded when foliage of *P. alba* served as food. In only one instance were the larvae noted in abundance feeding on willow.

"In the vicinity of Budapest the life cycle of the satin moth is normally about the same as in New England, but occasionally a partial second generation occurs in Hungary. At one point in the fall of 1926 a considerable number of larvae developed beyond the hibernating stage. Many became half grown, and in one instance a larva completed its development, pupated, and produced a moth on August 26.

"Observations have shown that hymenopterous and tachinid parasites and certain fungus diseases constitute the principal natural enemies of this species, although a predatory mite has been found to exert a strong influence in its biological control. During the period referred to, heavy infestations have occurred at some of the points near Budapest, but in the autumn of 1929 they had practically disappeared over the whole area. This sudden disappearance suggests that perhaps other factors, either biologic or climatic, the nature of which is not yet understood, may have been the underlying cause of control."

**The corn earworm: Biology and control,** L. P. DITMAN and E. N. CORY (*Maryland Sta. Bul. 328 (1931), pp. 443-482, figs. 11*).—This is a report of studies commenced in 1925 by H. H. Shepherd and continued since 1927 by the present authors. The details of the work are presented largely in 24 tables.

The winter was found to be passed, in Maryland, in the pupal stage, the emergence of adults in cages taking place from the first of July to the middle of August, the field emergence being earlier. "Because of the long period of emergence of overwintering ear worms, broods during the summer are not distinct. Control must be based on the development of the corn plant rather than on the timing of the broods. Oviposition was found to be greatest on the corn silks, approximately 70 per cent of the eggs being laid there. There is considerable mortality in the egg stage; approximately only 50 per cent of all eggs laid were found to hatch. The time required for young larvae hatching on the silk to enter the ear was found to vary from 0.5 hour to over 2.5 hours. The corn ear worm apparently may accommodate itself to varying conditions of food by variations in the number of molts; an increase requires a longer period for the larvae to reach maturity. It was found during the heavy infestation of corn ear worm in 1930 that approximately 50 per cent of young ears were infested with young larvae before silking, and further that most of these infestations were by young larvae entering through the husk. The mortality of young larvae hatching on plants before tasseling is high. Probably less than 5 per cent of larvae hatching on young corn plants survive.

"*Trichogramma minutum* Riley was the only insect parasite found attacking the corn ear worm at College Park. Lead arsenate proved to be the most efficient insecticide against the corn ear worm. No satisfactory repellents or attrahents were found. Dusts were superior to sprays. Aqueous sprays of both contact and stomach poisons proved of no value. Desilking of ears provided some protection from the corn ear worm."

**The value of husk protection to corn ears in limiting corn earworm injury,** W. J. PHILLIPS and G. W. BARBER (*Virginia Sta. Tech. Bul. 43 (1931), pp. 24, figs. 7*).—This is a report of work conducted from 1922 to 1927 in cooperation with the U. S. D. A. Bureau of Entomology, which has shown husk protection to be an important factor in reducing ear worm damage. During this period 13 varieties of corn, most of which were standard varieties and which showed various degrees of husk protection, were used. A total of 239 separate plats were grown and 51,717 ears examined. The ears were divided into 6 classes for the purpose of comparison, namely, those with long tight, medium tight, short tight, long loose, medium loose, and short loose husks.

"It was found that all the varieties of corn studied produced ears representing each of these husk type classes, but the proportions of the 6 husk types differed greatly in the several varieties. Brief summary tables are given showing the percentage of each type of ear for each variety, the amount of ear worm injury, and the average extent of injury for each variety over the entire period. In general, ears with long tight husks were less damaged than ears of any other class, and they received on an average only about half the injury that was inflicted on ears having short loose husks. Therefore, varieties having a large percentage of long tight husks were injured much less severely than those having a smaller percentage of ears so covered. Finally, of those varieties having a high percentage of ears with long tight husks, many had undamaged ears, whereas varieties having fewer such ears had relatively few entirely free from ear worm injury.

"The most effective protection is offered by a husk which extends for at least 5 in. beyond the tip of the cob and is tightly wrapped throughout its entire length. This type of husk will, for the most part, limit the activity of the ear worm to the long, narrow, silk channel beyond the ear. Ears protected by long tight husks show much less damage from various enemies associated with the feeding of the ear worm, such as fungi, grain beetles, and grain moths, and such ears are more effectively protected from depredations by birds which feed extensively on the grain of poorly protected ears."

**The pink bollworm of cotton in Porto Rico** [trans. title], G. N. WOLCOTT and F. SEÍN, JR. (*Porto Rico Dept. Agr. and Labor Sta. Circ. 95 (1931), Spanish ed., pp. 13, figs. 4*).—This is a revised edition of Circular 63, published in 1921 (E. S. R., 48, p. 56).

**Two citrus leaf miners of the Far East,** C. P. CLAUSEN (*U. S. Dept. Agr. Tech. Bul. 252 (1931), pp. 14, figs. 6*).—This is an account of studies of the minute lepidopteran *Phyllocnistis citrella* Stain., and of the coleopteran *Throscoryssa citri* Maulik. While the former is the common citrus leaf miner of the Far East and widespread, the latter is newly discovered and known only from a limited district in India.

"*P. citrella* was formerly recorded as *P. saligna* Zell. when found in Japan, but [*P.*] *saligna* is now known to be limited to northern and central Europe and to hosts other than Citrus. *P. citrella* has other host plants, but has been found principally upon Citrus, which it injures by mining in the leaves. The insect hibernates as a moth, and there may be as many as six generations each year in southern Japan.

"*T. citri* hibernates as a beetle in sheltered places and has but one generation a year. It is not known to have any other host but the varieties of Citrus. The larvae eat out the tissue from between the two leaf surfaces, frequently leaving the leaf by an exit hole in the upper surface and reentering the same or another leaf through the under surface. Pupation is in a cell in the ground. The adults feed gregariously, eating out irregular portions from the margins of the young foliage and the tissue from the lower surface of the older leaves. From 35 to 40 days cover the entire period from the placement of the egg to the emergence of the adult. The beetles are not seen after the first week of June. Two parasites, a braconid and a chalcidoid, were found to attack the larvae of *T. citri*. A résumé is given of the literature on leaf mining Chrysomelidae."

**Plowing as a control measure for the European corn borer in western New York,** H. N. BARTLEY and L. B. SCOTT (*U. S. Dept. Agr. Circ. 165 (1931), pp. 28, figs. 6*).—The authors first report upon experimental control work in which hand burials were made in the fall and spring. Many of the larvae were buried during the fall of 1920 and spring of 1921 in pits 24 in. or more in depth, the observations made at later dates indicating that 100 per cent of the larvae had been destroyed. From the fall of 1921 to the spring of 1924 the larvae were buried by hand in various types of soil and at different seasons of the year. Some were buried in cages, while others were placed in the ground with no restrictions of any kind. Many of the buried larvae were recovered on the surface of the soil either in specially prepared traps or in sections of cornstalks.

The amount of migration observed varied only slightly in the several types of soil, and it was apparent that no particular type could be recommended as being particularly effective in reducing the migration of buried larvae to the soil surface. A greater mortality was indicated when larvae were buried in late fall than when they were buried earlier in the season while the soil temperature was comparatively high. Little or no spring activity of buried larvae was noted until April 1, or until the soil temperature reached approximately 40° F. The hand burials indicated that many larvae, when buried to a depth of 6 in., were capable of reaching the soil surface in good condition and of producing fertile adults. It was found that the migrating larvae often hibernated in cornstalks or other plant material on the surface of the ground, when such material was available.

Plowing experiments, next reported upon, were commenced in the fall of 1923 and continued to the spring of 1927. The plowings were all approximately 6 in. in depth, and the soil was a clay loam representative of the soil of the surrounding country. Many larvae were recovered on the surface of the soil, either within sections of cornstalks or in corrugated paper traps. In general, the larvae that reached the surface in the plowing experiments received less protection from birds, insects, and the elements than those larvae that reached the surface in the hand burial experiments. The number of larvae found in the traps of spring plowings located adjacent to the places of burial on the soil surface where there was no débris was more than three times as great as where cornstalks were placed on the soil surface at the rate of 30 linear ft. per square rod, and more than twice as many larvae were found in traps located adjacent to the burials when no débris was used as in traps similarly located but with débris. Thus it appears that a large number of the migrating larvae took advantage of the protection afforded by cornstalks when the latter were available, and it is deemed quite probable that a much larger number would have found protection in débris if the traps had not checked their migration. The fact that there are many records of the destruction of corn borer larvae by robins and other birds is considered to indicate very strongly that practically all of the migrating larvae which failed to obtain shelter of some kind were destroyed by birds or insects.

Observations conducted in commercial plantings of corn to determine the amount of larval mortality resulting from various methods of disposing of plant remnants showed very plainly the importance of cleanly plowing under all plant remnants.

**The control of the lesser peach borer with paradichlorobenzene solutions,** O. I. Snapp and J. R. Thomson (*U. S. Dept. Agr. Circ. 172 (1931), pp. 12, figs. 2*).—In experimental work with paradichlorobenzene solutions conducted during the years 1928 to 1930, inclusive, at Fort Valley, Ga., paradichlorobenzene dissolved in crude cottonseed oil in the proportion of 1 lb. of the chemical to 2 qts. of oil proved to be more effective against the lesser peach borer than any of the other materials tested. It gave from 93.4 to 97.9 per cent control when applied about April 1.

"Emulsions of paradichlorobenzene and crude cottonseed oil applied as a spray are not so effective against the lesser peach borer as the same chemical dissolved in crude cottonseed oil and applied with a paintbrush. For best results the wash must be applied well beyond the edges of borer indications, and the areas must be thoroughly soaked. The wash can not be applied very satisfactorily with a sprayer. Linseed and corn oils are not as satisfactory as cottonseed oil for use with paradichlorobenzene, as they are thicker and the linseed oil is sticky. Crude cottonseed oil is a more suitable solvent for paradichlorobenzene than mineral oils when used for lesser peach borer control. Removal of gum, frass, loose bark, etc., from infested areas before treatment did not improve the results from the paradichlorobenzene-cottonseed oil wash. There was no discernible injury to peach trees from any of the treatments tested on areas infested by the lesser peach borer. If the paradichlorobenzene-cottonseed oil wash is stored it should be placed in a tight container so as to close it entirely to the air. Recrystallization will take place with cold weather, but the crystals will disappear again with warm weather."

**The Coccinellidae (ladybird beetles) of Minnesota (Coleoptera),** W. C. Stehr (*Minnesota Sta. Tech. Bul. 75 (1930), pp. 54, figs. 4*).—In the first part of this bulletin the author deals briefly with the biology and characteristics of the Coccinellidae, including a list of 51 species examined during the course of the study, which records the number of specimens of each that were studied. Then follows a key to the Minnesota species of the family, a key to the tribes, and keys to the genera. The accounts of the species list their synonymy and take up their occurrence throughout the State. A three-page list of the literature cited is included.

## ANIMAL PRODUCTION

**Pineapple bran as a feed for livestock,** L. A. Henke (*Hawaii Sta. Circ. 2 (1931), pp. 19*).—This is a summary of many trials undertaken to determine the value of pineapple bran for the various classes of livestock.

While no tests have been conducted with work stock, practical demonstrations on pineapple plantations have shown that pineapple bran is a valuable feed for such animals. For dairy cows (E. S. R., 61, p. 262), pineapple bran when supplemented with high-protein feeds made a satisfactory and economical feed. In feeding pigs (E. S. R., 61, p. 606), pineapple bran was not equal to either corn or barley, but the prevailing prices of concentrates have made this an economical feed when it made up about 50 per cent of a ration. For poultry feeding, pineapple bran has not proved satisfactory, and no tests have been conducted on the value of this feed for beef cattle.

**Commercial feeds in Kentucky in 1930,** J. D. Turner, H. D. Spears, W. G. Terrell, and L. V. Amburgey (*Kentucky Sta. Bul. 315 (1931), pp. 85–125*).—A summary of the results of official inspection and analysis of feeding stuff samples. collected during 1930, giving the manufacturer's name, kind of feed, and number of samples equal to or below their guaranty (E. S. R., 64, p. 657).

**Relative efficiency and profitableness of three grades of feeder steers,** P. Gerlaugh and C. W. Gay (*Ohio Sta. Bimo. Bul. 152 (1931), pp. 179–184, fig. 1*).—In an effort to determine the profitableness of three different grades of yearling feeder steers, a test was conducted in cooperation with the Ohio State University. A basal ration consisting of 10 lbs. of silage, 1.5 lbs. of equal parts of cottonseed and linseed meal, 4 lbs. of soybean hay, later reduced to 2 lbs., and a full feed of corn-and-cob meal was fed to lots of choice, medium, and common yearling steers, respectively, for 140 days. The medium and choice steers were fed for an additional 28 and 56 days.

The average daily gains in the respective lots were 2.15, 2.4, and 2.33 lbs. per head for 140 days and 2.19 and 2.47 lbs. per head for 196 and 168 days. The cost per 100 lbs. of gain for 140 days was highest in the lot of choice steers and lowest in the lot of medium steers, and the same was true at the end of the longer periods. At the end of 140 days the returns per bushel of corn were 35, 61, and 73 cts., respectively, but at the end of 196 and 168 days the returns were only 27 and 37 cts. These results indicate that the cheaper grades of steers and a short feeding period have a decided advantage in times of a declining market. The work also showed that the lower grades of fat cattle sell relatively higher than the better grades during the spring season.

**A study of the grades of feeder steers while on feed and after slaughter,** J. H. Knox (*Texas Sta. Rpt. 1930, pp. 27, 28*).—Continuing this study (E. S. R., 63, p. 466), 10 yearling steers of choice, good, medium, and common grade each were fed in separate lots on the same ration. During a 157-day test the average daily gains in the respective lots were 2.12, 2.09, 2.3, and 2.32 lbs. per head. The selling price per hundredweight was $2.25 higher for choice than for common steers, $1.84 higher than for medium steers, and 88 cts. higher than for good steers. The dressing percentage decreased progressively from 60.14 for choice steers to 57.15 for common steers.

**I, Salt sick, its cause and prevention; II, Mineral supplements for cattle,** R. B. Becker, W. M. Neal, and A. L. Shealy (*Florida Sta. Bul. 231 (1931), pp. 23, figs. 13*).—The first part of this bulletin reviews the early station work on different phases of this cattle problem and discusses the economic losses, cause, symptoms, cattle affected, and the practice of changing cattle from deficient range areas to areas where they made rapid recovery and restored the supply of mineral elements lacking on the deficient ranges. As a result of investigations now in progress, it is recommended that cattle on salt sick soil areas be given a "salt sick" lick composed of 100 lbs. of common salt, 25 lbs. of red oxide of iron, and 1 lb. of finely ground copper sulfate. For more advanced cases 0.5 lb. of ferric ammonium citrate and 2.25 gm. of powdered copper sulfate are dissolved in 1 gal. of water, and 3 fluid oz. per day of this solution given to mature cows and 2 fluid oz. to younger animals.

The second part discusses the value of different minerals as supplements to rations deficient in minerals. Common salt is recommended for cattle at all times, and when calcium or phosphorus is deficient in the ration access to finely ground steamed bone meal supplies the deficiency. Rock phosphate, because of its injurious effects, and iodine and sulfur, because they are not needed by livestock in Florida, are not recommended. Commercial mineral mixtures are expensive as compared with the use of specific supplements and in some cases have proved detrimental.

**[Sheep breeding studies at the Moses Fell Annex Farm]** (*Indiana Sta. Circ. 183 (1931), pp. 18, 20, 21, figs. 5*).—A flock of C-type Merino ewes was bred to a purebred Merino ram, while a similar flock was bred to a purebred Southdown ram. A flock of 25 western ewes and a flock of native ewes were also bred to Southdown rams. The western and native ewes produced more lambs and faster gaining lambs than the Merino ewes. The Merino-Southdown lambs were larger and thriftier than the Merino lambs.

**Comparison of Hampshire and Rambouillet rams as sires of market lambs,** W. E. Joseph (*Montana Sta. Bul. 250 (1931), pp. 15, figs. 5*).—Continuing this study (E. S. R., 64, p. 251), it was found that lambs sired by Hampshire rams out of grade fine wool ewes were heavier and in better condition than lambs by Rambouillet rams out of similar ewes when grazed on summer range adapted to the production of milk-fat lambs. However, when grazed on foothills or low mountain ranges, there was little difference in the condition or weight of the lambs.

The profitable use of one type of ram or the other on range adapted to the production of fat lambs appeared to depend upon the level of market prices, on the spread between feeder and fat lambs, and on the demand for fine wool ewe lambs for breeding purposes. The use of rams of the mutton breeds required careful consideration of the source of breeding stock, since large scale changes in type of rams often resulted in bringing into use rams below standard, and continued use of such rams necessitated the purchase of ewe stock after several years if fine wool ewes were desired. There were no appreciable differences in the weight of pelts of lambs sired by Hampshire rams and those of the fine wool lambs that were free from body wrinkles. On the basis of percentage of live weight, however, the pelts of the fine wool lambs were slightly heavier.

**Feeding low-priced wheat to lambs,** M. H. Saunderson and L. Vinke (*Montana Sta. Bul. 249 (1931), pp. 14, fig. 1*).—Feed-lot studies were made in cooperation with the U. S. D. A. Bureau of Agricultural Economics during the winter of 1930-31 of 30 lamb-feeding enterprises located in different sections of the State. The records based on feeding records, experiences, and financial statements of the operators were divided into two major groups, those feeding beet pulp or other beet by-products with wheat or other small grains and hay, and those feeding only wheat or other small grains, hay, and feed supplements.

When wheat, alfalfa hay, and beet pulp were fed, good results were obtained, and a fair profit over feed and other costs was returned. Some feeders found that a comparatively long period was required to finish lambs on wheat and alfalfa and that a full feed of grain was necessary in order to fatten the lambs. A heavy feeding of alfalfa without a corresponding increase in grain caused the lambs to grow rather than fatten. A mixture of barley and wheat was easier to handle than wheat alone. When wheat was fed the death losses ranged from 2 to 3 per cent, which were no higher than losses when other grains were fed. The same care was necessary in starting lambs on wheat as was needed for starting on other grains.

Most of the operators made use of beet tops and grain and hay stubble by pasturing lambs for from 3 to 5 weeks before starting them on a fattening ration. Using efficient equipment adapted to lamb feeding reduced labor costs and death losses.

**[Experiments with sheep and goats in Texas]** (*Texas Sta. Rpt. 1930, pp. 22, 23, 25–27, 28–31*).—This continues work previously noted (E. S. R., 63, p. 468).

*Relation of skinfolds to weight of fleece on Rambouillet sheep*, J. M. Jones and B. L. Warwick.—In order to study the skin folds in more detail, an accurate record of the number and estimated size of skin folds was made for each animal after the yearling fleece was removed, and the folds were given an arbitrary value according to their size. These values were totaled for each body region and then combined for a total figure or score for each animal. A study of the scores showed that more heavily folded animals were included in each type in the case of rams than ewes. The correlation coefficient between score and animal weight for ewes was 0.26±0.05, between score and 3-year-old fleece records 0.46±0.05, between score and shrinkage percentage 0.39±0.05, and between score and diameter of fiber on thigh 0.32±0.06. For yearling rams the only correlation found was between score and shrinkage percentage 0.3±0.08. The results showed that the only effect of skin folds was that as animals grew older those with abundant folds had heavier fleeces, that the fleeces shrank proportionately more, and that heavier-folded animals tended toward coarser wool on the thigh than smoother-bodied animals.

*Methods of preparing sorghum roughage and grains for feeding to fattening lambs*, J. M. Jones and A. K. Mackey.—In this test 6 lots of lambs were fed for 112 days. The feed required per pound of gain in lot 1 was 3.89 lbs. of whole threshed milo, 0.43 lb. of cottonseed meal, and 3.36 lbs. of alfalfa hay; in lot 2, 4.68 lbs. of whole threshed milo and 3.8 lbs. of alfalfa hay; in lot 3, 4.3 lbs. of whole oats, 0.48 lb. of cottonseed meal, and 3.1 lbs. of alfalfa hay; in lot 4, 5.28 lbs. of whole oats and 3.59 lbs. of alfalfa hay; in lot 5, 4.04 lbs. of ground threshed milo, 0.45 lb. of cottonseed meal, and 3.62 lbs. of alfalfa hay; and in lot 6, 1.72 lbs. of whole threshed milo, 2.81 lbs. of whole oats, 0.5 lb. of cottonseed meal, and 3.2 lbs. of alfalfa hay. The average daily gains in the respective lots were 0.36, 0.3, 0.29, 0.32, and 0.32 per head.

*Alfalfa hay v. sorghum fodder, sorghum fodder and alfalfa, and sorghum fodder and limestone for fattening lambs*, Stangel and J. M. Jones.—In cooperation with the School of Agriculture, Texas Technological College, six lots of 20 lambs each were fed a basal ration of ground milo heads and cottonseed meal. In addition the respective lots received alfalfa hay, equal parts of alfalfa hay and chopped hegari fodder, one part of alfalfa hay and three parts of chopped hegari fodder, chopped hegari fodder and 0.2 oz. of limestone flour per head daily, chopped hegari fodder and 0.4 oz. of limestone flour, and chopped hegari fodder. The average daily gains in the respective lots were 0.34, 0.33, 0.3, 0.34, 0.35, and 0.25 lb. per head. Lot 1 required less feed per unit of gain than any of the other lots, and lots 4 and 5 required less feed than lots 2, 3, and 6. Due to the difference in the price of alfalfa hay and ground hegari fodder, the lambs in lots 4 and 5 made the most economical gains.

*A study of the adaptation of the Corriedale sheep to southwest Texas conditions*, J. M. Jones and B. L. Warwick.—The smallest difference in weight of Rambouillet and Corriedale ewes was at 8 years of age, when the Rambouillets were 7.4 lbs. heavier, and the largest difference was at 2 years, when the Rambouillets were 19.1 lbs. heavier. Rambouillets sheared more coarse wool at all ages than Corriedales, and while up to and including 6 years the Corriedales sheared more clean wool, after this date the Rambouillets were equal to or slightly better than the Corriedales in this respect. In staple length of fleece the Corriedales excelled at all ages, the greatest difference being at 1 year of age and the least at 7 years. The fibers of the Corriedale fleeces were naturally coarser than those of the Rambouillets. The Corriedale ewes produced more lambs as yearlings than did the Rambouillets at the same age. During a 6-year period 3.5 per cent of the Rambouillet and 5.2 per cent of the Corriedale ewes failed to raise their lambs. The Corriedale ewes produced 5.9 per cent of twins and the Rambouillets 9.5 per cent. The percentage of lambs raised was 85.2 per cent for Corriedales and 80.1 per cent for Rambouillets. There was little difference in the mortality rate of the ewes.

*Determining grades and shrinkages of Texas wool and mohair*, S. P. Davis and J. M. Jones.—A study was made of the shrinkage of 8,476.7 lbs. of wool and 675.65 lbs. of mohair. The highest-shrinking wool fleece had a shrinkage of 75.47 per cent, while the lowest shrinkage was 58.58 per cent. The average shrinkage of fine Texas wool was 61.34 per cent, of half-blood wool 54.2, of three-eighths-blood wool 51.22, and of quarter-blood wool 49.5 per cent.

The average shrinkage of fleeces from 23 aged Rambouillet rams was 64.87 per cent, from 16 yearling rams 61.9, from 171 aged ewes 59.44, from 83 yearling ewes 62.73, and from 25 grade Rambouillet ewes 59.6 per cent. The average shrinkage of fleeces from 2 Corriedale rams was 50.85 per cent, from 27 aged ewes 50.39, and from 7 yearling ewes 50.1 per cent.

The average shrinkage of mohair fleeces from 18 Angora bucks in the fall of 1929 was 18.55 per cent and from 66 does 16.71 per cent. In the spring of 1930 the average shrinkage of mohair fleeces from 18 bucks was 16.83 per cent and from 69 does 22.26 per cent.

*Relation of age of animal to fineness of wool and mohair*, J. M. Jones and B. L. Warwick.—A study of the diameter of the fibers of Rambouillet sheep and Angora goats showed that wool reached its maximum average diameter when the animal was 4 years old, after which there was a small but steady decline to 11 years, while mohair continued to increase in diameter to the seventh year, remaining fairly constant to 10 years, and becoming coarsest at 11 or 12 years. The difference in average wool diameter between different ages was less than 0.0001 in., while the difference for mohair fibers was 0.0006 in.

**The Angora goat industry of Oregon, O. M. Nelson** (*Oregon Sta. Bul. 289* (*1931*), *pp. 27, figs. 6*).—Continuing this economic survey of the Angora goat industry in Oregon (E. S. R., 64, p. 368), it was found that only 22 per cent of the total farm investment on the farms studied was used by the goats. The total investment per goat was $30, of which $26.36 was for real estate investment. The total cost of labor per goat was 63 cts., of which 56 cts. was for operator labor. The amount of labor per goat, exclusive of contract shearing, was 2.11 hours. The gross cost of running goats was $3.05 per head, of which 63 per cent was for feed and pasture, 22 per cent for labor, 10.5 per cent for capital charges, 2.9 per cent for predatory animal control, and 1.6 per cent for miscellaneous expenses. The annual losses averaged 17.4 per cent, of which more than half was due to disease and predatory animals.

The average flocks were composed of 1 per cent of billies, 41 per cent of does, 20 per cent of kids, and 38 per cent of wethers. The average fleece weight for all flocks was 4.63 lbs.

**Rations for fattening swine,** E. G. Godbey (*South Carolina Sta. Bul. 277 (1931), pp. 8, figs. 2*).—The results of four experiments (E. S. R., 64, p. 663) show that self-feeding corn and fish meal free-choice to fall pigs in dry lot increased the rate of gain and the return per pig as compared with hand-feeding the same feeds. On green barley pasture the rate of gain was not increased by self-feeding free-choice, but the cost per 100 lbs. of gain was decreased and the return per pig increased. The green barley improved the hand-fed ration more than the free-choice ration, but in both cases the forage decreased the cost of gains and increased the return per pig. Grazing increased the yield of barley per acre as compared with the adjoining lots not grazed. This difference was attributed to the "stooling out" of the grazed barley.

**Methods of feeding and the feeding value of grain sorghums for swine,** F. Hale (*Texas Sta. Rpt. 1930, pp. 78, 79*).—Continuing this study (E. S. R., 63, p. 469), 2 tests of 90 days each were conducted.

In the first test 8 lots of pigs averaging 55 lbs. per head were used. Pigs self-fed whole milo in dry lot gained as much as those fed ground milo and required 8 lbs. more milo and 3 lbs. less protein supplement per 100 lbs. of gain. Pigs self-fed whole kafir gained 8 lbs. more per pig than those fed ground kafir and needed 5 lbs. more grain and 3 lbs. less protein supplement per 100 lbs. of gain. Pigs self-fed whole dry milo gained as much as those fed whole milo soaked for 24 hours and hand-fed three times daily, and required 1.5 lbs. more grain and 4 lbs. less protein supplement to produce 100 lbs. of gain. Pigs self-fed dry milo heads gained 9 lbs. more per pig than those fed milo heads soaked for 24 hours and hand-fed three times daily, and required 48 lbs. more heads and 4.25 lbs. less protein supplement per 100 lbs. of gain.

In the second test, 6 lots of 10 pigs each averaging 62 lbs. per head were used. Pigs hand-fed whole kafir twice daily in a trough on a concrete floor in dry lot gained 16 lbs. more per head than pigs fed the same amount of whole kafir on a dirt floor, and required 58 lbs. less grain and 8 lbs. more tankage to produce 100 lbs. of gain. Pigs hand-fed ground kafir twice daily as a slop feed gained 1 lb. more per pig than those hand-fed whole kafir twice daily and saved only 2 lbs. of grain and 1.5 lbs. of tankage per 100 lbs. of gain. Pigs self-fed whole milo gained 6 lbs. more per head than those self-fed ground milo, and required 13 lbs. less grain and 5 lbs. less tankage to produce 100 lbs. of gain.

**The causes of soft pork,** W. L. Robison (*Ohio Sta. Bimo. Bul. 152 (1931), pp. 184–189*).—In this discussion of the causes of soft pork, the information was obtained from published reports of the cooperative soft pork investigations carried on by the U. S. Department of Agriculture and a number of State experiment stations.

**[Poultry studies in New Hampshire]** (*New Hampshire Sta. Bul. 256 (1931), pp. 18–20*).—The results of several studies are noted.

*Poultry farm study.*—This study covered 22 flocks of Rhode Island Red pullets, each flock being of uniform age. A sample of 100 eggs was taken at weekly intervals from each flock and each egg weighed individually. At 50 weeks of age the birds were laying eggs of maximum size. January-hatched pullets began laying maximum-sized eggs in November or December, February pullets in December or January, while May pullets did not begin laying large eggs until March or April. Of the eggs laid by the three best flocks, 87 per cent weighed 24 oz. or more per dozen when the birds were 50 weeks old, while only 61.7 per cent of the eggs from the three poorest flocks weighed this much.

*Poultry thrives on cafeteria system.*—Continuing this study (E. S. R., 63, p. 666), T. B. Charles and H. O. Stuart fed two pens of 100 birds each for 12 weeks. One pen received the regular station laying ration, while the other lot had each ingredient of the ration supplied in an individual hopper. The birds fed free choice ate more corn meal and less whole corn and more whole wheat and less bran than those given the regular ration. The nutritive ratios of the feeds consumed were 1:4.98 and 1:4.82 in the free choice and control lots, respectively.

Feeding an abundance of mangel beets to two lots of Leghorn hens lowered egg production and threw the birds out of condition. These birds were slow to respond to corrective treatment. Affected birds showed a shrinking of comb and wattles, and the comb took on a purplish cast. The majority of the birds molted.

*Vitamin A requirements of chicks.*—Birds fed varying levels of cod-liver oil by Stuart in addition to a basal ration otherwise deficient in vitamin A showed marked kidney injury, while microscopic examination of the feces indicated vitamin A deficiency. These results were believed to indicate that a ration should contain other sources of vitamin A besides cod-liver oil. Control groups fed the basal ration only showed no retardation in growth.

*Trials of irradiated substances.*—In this test by Stuart three groups of 60 chicks each were fed rations containing 0.25 per cent of irradiated yeast and 0.5 and 1 per cent of irradiated ergosterol, respectively. The growth rate was satisfactory in all lots, and there were no indications of rickets.

*Rapid feathering helped to prevent bare backs.*—Stuart and Charles found that chicks hatched from a rapid feathering strain of birds were well feathered before reaching broiler age, while a large percentage of bare-back broilers was evident in birds hatched from a slow-feathering strain.

*Temperatures in battery brooding.*—Stuart and Charles noted that chicks developed a slipped-ligament condition of the hock under a high-brooding temperature, while other groups brooded under similar conditions but with reduced temperatures were only slightly affected.

*Control of cannibalism.*—Stuart and Charles found that supplying pine boughs daily to two pens of 200 birds each was effective in controlling an outbreak of cannibalism.

**Methods of feeding Leghorn hens,** J. S. Carver (*Washington Col. Sta. Bul. 254 (1931), pp. 16, fig. 1*).—Concluding this study (E. S. R., 64, p. 669), the results do not indicate that hens require scratch grains fed in the litter either for exercise or maximum production. Feeding scratch grains in limited amounts in hoppers in addition to the mash proved to be fully as efficient as the feeding of mash in hoppers and scratch grains in the litter. Feeding hens by means of pellets compared favorably with the all-mash method, but neither method gave as satisfactory results as either of the above scratch and mash methods of feeding laying hens.

**Study of the calcium-phosphorus ration in feeds for chicks, R. M. Sherwood** (*Texas Sta. Rpt. 1930, p. 82*).—Preliminary studies indicate that chicks receiving rations with a calcium-phosphorus ratio of from 1:0.29 to 1:057 grew better than those receiving rations with a calcium-phosphorus ratio of 1:1.42.

**The effect of cottonseed meal and other feeds on the storage quality of eggs, R. M. Sherwood** (*Texas Sta. Bul. 429 (1931), pp. 19, figs. 2*).—Continuing this study (E. S. R., 63, p. 470), it was found that eggs from hens fed meat and bone scraps held up well in storage. Feeding cottonseed meal, crude cottonseed oil, partially refined cottonseed oil, and ether extract of cottonseed meal to hens caused their eggs to deteriorate in storage. The yolks of such eggs varied in color from salmon to dark green, and the whites from normal color to pink. The color analyses of the eggs indicated that the difference in the color of the yolks of storage eggs from hens fed meat and bone scraps and from hens fed cottonseed meal was due to a large reduction in the amount of red, orange, and yellow pigments and a smaller reduction in the amount of green pigment in the yolks of the cottonseed meal eggs.

Feeding a mash containing 9 per cent or more of cottonseed meal caused the yolks of eggs to increase in size during storage and to contain a smaller percentage of fat than yolks of eggs from meat and bone scraps rations. As the amount of cottonseed meal in the ration increased, the percentage of fat in the yolk decreased accompanied by an increase in the percentage of water, but the percentage of protein remained constant probably because the yolk absorbed albuminous material along with water from the whites. When hens received 2 gm. of cottonseed meal daily a small percentage of their eggs graded as seconds when removed from storage, and when 3 gm. were fed a larger percentage of eggs graded seconds and a few as discards at the end of the storage period.

Over 90 per cent of the eggs laid by hens receiving 8, 10, and 12 gm. of cottonseed meal daily and nearly 50 per cent of the eggs laid by hens receiving 9 per cent of cottonseed meal in their mash deteriorated during storage. Feeding extracted cottonseed meal with a low fat content did not cause the eggs to deteriorate to the same extent as feeding regular cottonseed meal, and feeding 1 gm. daily of refined cottonseed oil and cod-liver oil had no effect on the storage quality of the eggs. Storing for 5 months in a frozen condition the mixed yolks and whites of eggs from hens fed cottonseed meal resulted in a dark red color of the mixture.

It was evident that the cause of deterioration of eggs during storage was either the oil of the cottonseed meal or something closely associated with it. Feeding lettuce did not correct the injurious effects of cottonseed meal on the storage quality of eggs.

**Natural and artificial incubation of hens' eggs, C. M. Bice and F. G. Botelho** (*Hawaii Sta. Circ. 3 (1931), pp. 23, figs. 16*).—The hatching of eggs by natural and artificial means is discussed in this publication.

**Estimating egg production by the score card, C. S. Platt and J. C. Taylor** (*New Jersey Stas. Hints to Poultrymen, 19 (1931), No. 12, pp. 4, fig. 1*).—The use of the score card as a supplement to trap nest records in the selection of breeding stock is described.

**The role of egg laying contests in flock improvement, J. W. Goodman** (*New Jersey Stas. Hints to Poultrymen, 19 (1931), No. 10, pp. 4, fig. 1.*)—The value of egg-laying contests in the establishment of high-grade flocks of record birds is described and illustrated by a diagram.

## DAIRY FARMING—DAIRYING

**[Dairy cattle studies in New Hampshire]** (*New Hampshire Sta. Bul. 256 (1931), pp. 5, 6*).—The results of the two studies are noted.

*Perspiration a factor in animal metabolism.*—In cooperation with the Carnegie Institution of Washington, E. G. Ritzman found a wide variation in the amount of water given off through the lungs and skin of dairy cows. Even on a maintenance ration from two to three times more water was lost by insensible perspiration than the amount passed in the urine. Under normal temperature conditions and on a uniform feed level the amount of water passed as urine remained fairly constant, but the amount lost as insensible perspiration varied as much as 12 or more pounds. However, when a sudden drop in temperature occurred the insensible perspiration dropped also and more excess water was eliminated as urine.

*Higher energy value found for alfalfa.*—Nutrition studies showed that the net energy value of timothy hay was 43 therms and of linseed meal 89.9 therms. These results closely agreed with those of Armsby. On the other hand, alfalfa hay had a net energy value of 49.6 therms per 100 lbs. of hay, which was materially higher than the amount (34.2 therms) given by Armsby.

**[Experiments with dairy cattle in Texas]**, O C. Copeland (*Texas Sta. Rpt. 1930, pp. 79–82*).—The results of two studies, both of which are continued (E. S. R., 63, p. 472), are noted.

*Feeding value of cottonseed hulls as a roughage for growing dairy heifers.*—Up to the present time groups of heifers fed hay or cottonseed hulls have not differed significantly in score in five different scorings, except in one case when the difference was only 3.2 times the probable error.

*The use of cottonseed meal and hulls as a ration for lactating dairy cows.*—The two groups of cows that had been alternating on the cottonseed meal and balanced rations were placed in dry lot and received the cottonseed meal ration only. The first of these groups was fed cottonseed hulls and silage ad libitum, while the second group received hulls only. The other two groups of cows were continued as before. The production of the groups in dry lot was somewhat lower than that of the groups on pasture, and those receiving hulls only produced considerably less than those receiving hulls and silage. Some of the cows in both groups in dry lot have had their eyesight impaired, but none have gone completely blind, and some have shown slight swelling in the joints which was temporary only. Of the cows in dry lot, those receiving silage were in better condition than those receiving hulls only. Considerably more udder trouble as shown by infected quarters and ropy milk was evident in the dry lot cows than in the cows on pasture. These results show the value of pasture for cows fed cottonseed meal as the sole concentrate with cottonseed hulls as roughage. Silage delayed the undesirable effects of the cottonseed meal-cottonseed hull ration, but did not eliminate them to the same extent as did pasture.

**The intensive management of permanent pasture in dairy farming,** R. M. Salter and R. E. Yoder (*Ohio Sta. Bimo. Bul. 152 (1931), pp. 155–163, figs. 3*).—The second year of a study of the intensive Hohenheim system of pasture fertilization and management has been completed. A 30-acre bluegrass pasture was divided into 3 6-acre paddocks and 3 4-acre paddocks. A basic fertilizer treatment of 500 lbs. of superphosphate and 120 lbs. of muriate of potash per acre was applied to the entire area except for small check sections. Sulfate of ammonia was applied at the rate of 150, 150, 100, and 100 lbs. per acre at intervals from March 15 to August 20 each year. Three small test plats were located in each paddock, one of which received no treatment, one the basic fertilizer, and one the complete treatment.

This system of management was found to have the following advantages: A lengthening of the grazing season by about 3 weeks, an increase in protein content of the herbage and in total production of both protein and dry matter, an increased carrying capacity per acre with corresponding decrease in grazing area required, a reduced manger feed consumption, and an increased density of turf. The disadvantages of such a system were a relatively high acre cost, the need for skillful grazing management, and the difficulty in maintaining white clover in the herbage. The adoption of such a system depended upon the market price of nitrogenous fertilizers, the amount and value of available pasture, its ability to produce grass, and the response of the soil to fertilizer treatment.

It is suggested that for soil which is fairly acid an initial application of lime is advisable. The size of the paddock should be determined by the size of the herd, and each paddock should be provided with shade and water. Mowing the pasture once or twice a year prevented weeds from going to seed, and harrowing to scatter dung piles promoted even growth over the entire area. The cows were turned into the pasture when the grass was 3 or 4 in. high and were shifted to a new field when the herbage had been grazed off.

**Early, intermediate and late cut soybean hay for milk and butterfat production,** J. H. Hilton, J. W. Wilbur, and W. F. Epple (*Indiana Sta. Bul. 346 (1931), pp. 24, figs. 14*).—Concluding these studies (E. S. R., 65, p. 169), it was found that soybean hay cut when the pods were completely formed, the beans well formed, and the lower leaves turning yellow was superior for both milk and fat production to hays cut in earlier stages of maturity. On the basis of production per acre late-cut hay produced about 19 per cent more milk and 29 per cent more butterfat than early-cut hay. In the two tests conducted to compare intermediate and late-cut hay, the late-cut hay produced about 11 per cent more milk and 12 per cent more fat in one test and approximately 13 per cent more milk and 18 per cent more fat in the second test than early-cut hay on the acre unit basis. There was practically no difference in the effect on body weight of the different hays. The cows refused 3 per cent of the early-cut hay, 5 per cent of the intermediate-cut hay, and 5.4 per cent of the late-cut hay.

**Potatoes for dairy cows,** J. R. Dice (*North Dakota Sta. Bul. 249 (1931), pp. 19, fig. 1*).—Concluding this study (E. S. R., 63, p. 866), potatoes fed in amounts of from 25 to 40 lbs. per head were found to be a good succulent feed for cows in milk. The milk and fat production was as high when potatoes were fed as when corn silage was fed. Since the potatoes were not as palatable and were more laxative than corn silage, the cows lost their appetite for them after several months' feeding. It was found necessary to cut or crush potatoes before feeding in order to avoid choking. When cows were fed for considerable periods on potatoes that were partly decomposed; sprouted; sunburned; frozen and thawed out for short and long periods; decomposed, sprouted, and sunburned; or on potato sprouts; there were no evidences of toxic properties in either the potatoes or potato sprouts, and there was only one case of slight digestive disturbance.

The flavor and aroma of the milk and butterfat were not affected by feeding potatoes, and butter made from fat produced while cows were on potatoes was normal in body, texture, and keeping qualities. Milk and cream rapidly took on a potato flavor when exposed to air heavy with potato aroma. While pasteurizing potato-flavored cream at 142° F. for 30 minutes removed some of its objectionable flavor, it did not render the cream fit for the manufacture of even fair butter.

**Cocoanut meal in the dairy ration,** A. E. Perkins (*Ohio Sta. Bimo. Bul. 152 (1931), pp. 175–179*).—The Jersey herd at the Hamilton County Experiment Farm was divided into two groups and fed by alternate calendar months on the two grain rations being compared from November to March, inclusive, The roughage portion of the ration consisted of mixed hay, corn stover, and corn silage. One of the grain mixtures contained no coconut meal, while in the other mixture 300 lbs. of coconut meal replaced 75 lbs. each of cottonseed and linseed meal and 50 lbs. each of ground corn, oats, and wheat. The percentage of digestible crude protein was slightly lower and the total digestible nutrients slightly higher in the coconut meal mixture. The grain was fed at the rate of 1 lb. to 2.5 lbs. of milk produced.

The production of milk was about 3 per cent greater, and the cost of the ration was slightly lower when the coconut meal mixture was fed. Since the coconut meal had a lower protein content than cottonseed meal and linseed meal, substitution could not be made pound for pound without lowering the protein content of the mixture. For this reason more coconut meal had to be used, replacing part of the home-grown grains as well as the high-protein concentrates. The fat test of the milk was not increased by the use of the coconut meal.

**Raising calves on dry calf meals,** I. R. Jones, P. M. Brandt, and F. D. Wilson (*Oregon Sta. Bul. 290 (1931), pp. 30, figs. 18*).—In an effort to determine at what age calves could be successfully weaned from milk; if it were possible to raise thrifty calves on dry calf meal, hay, and water when milk feeding was discontinued at about 6 weeks of age; the relative value of 3 dry calf meals varying in amount and quality of proteins, minerals, and vitamins; and the cost of raising calves to 6 months of age under this system, grade calves averaging 14 days of age were divided into 3 lots of 10 head each. The calf meals fed in the respective lots contained 22.96, 16.47, and 19.46 per cent of protein, while the oats-and-vetch hay fed to all lots contained 7.34 per cent of protein. Individual records were kept of all amounts of milk (to 6 weeks of age) and calf meal consumed. The hay was fed to each group and the average consumption determined, and fresh water was kept before the animals at all times. Weight, height at withers, heart girth, and belly girth were taken at the beginning of the test and once each month thereafter.

While the three calf meals used produced satisfactory growth, the ones containing the higher amounts of protein gave somewhat the better results. The calves were weaned from milk at from 30 to 50 days of age without any noticeable setback, and the animals were normal in size at 180 days of age. Up to 196 days of age the average calf of all groups had consumed 154 lbs. of whole milk, 87 lbs. of reconstituted skim milk, 532 lbs. of calf meal, and 567 lbs. of hay. The average daily gain of all calves was 1.24 lbs. per head, and the average cost per pound of gain was 8.2 cts., using basic prices for feed stuffs. This system of raising calves lowered the feed cost to 6 months of age from $10 to $15 per head as compared with the feeding of milk for the entire period. In addition to saving feed, the system also required less labor.

**Milk cools best in dry storage** (*New Hampshire Sta. Bul. 256 (1931), pp. 7, 8*).—Continuing these studies (E. S. R., 63, p. 270), W. T. Ackerman and H. C. Moore found that the amount of contamination of milk was less in dry coolers than in wet type coolers. The difference was due to the slower cooling of the wet type cooler, allowing rapid multiplication of the original bacterial content. It was shown that milk containing less than 5,000 bacteria per cubic centimeter at the time cooling started and held below 50° F. was insured of desirable quality. A 40-qt. can of milk which required 1.5 hours to cool to 50° and 4.5 hours to cool to 40° had a bacterial count 15.5 hours after production of only 500 per cubic centimeter. On the other hand, a can containing 75,000 bacteria per cubic centimeter at the time of production increased in bacterial count to 245,000 per cubic centimeter in 16 hours. Milk cooled with a surface cooler, using well water and the cans placed in dry storage, may increase only 8 per cent in bacterial count in 12 hours or it may increase even 610 per cent. Initial contamination of milk was usually found to be due to dirty milking machines, dirty cans, or dirty cows. Bacterial counts taken on milking machines as soon as the machine was removed from the cow showed bacterial counts ranging from 100 to 570,000 per cubic centimeter.

**Transporting and handling milk in tanks,** R. P. Hotis (*U. S. Dept. Agr., Tech. Bul. 243* (*1931*), *pp. 24, figs. 9*).—This study was undertaken to determine the methods of handling milk delivered to plants in tanks, the labor and time requirements of tank delivery, the advantages and disadvantages of such delivery, and the cost of handling milk in this manner. The results obtained were based on records from 300 tank trucks, 89 trailers, and 53 tank cars, and observations were made on 82 tank trucks, 29 trailers, and 28 tank cars.

The advantages of tank truck and tank car hauling over hauling milk in cans were found to be (1) better temperature control of the milk, (2) better sanitation, (3) smaller investment in cans, (4) smaller loss of milk, (5) less labor at country plants. (6) the handling of more milk in the same area by the city plant, (7) a saving in washing powder and labor needed for washing, (8) reduction in floor space at country plants, and (9) as an advertising medium.

The tank truck was the most flexible type of transportation. Another advantage of this method of hauling over the tank car was that country plants could be located independent of railroad sidings and on cheaper land. The method also saved cartage from terminal to milk plant. On the other hand, the tank car had a number of advantages over the tank truck which benefited the railroad as well as the milk plant. With this method the railroad had no investment in the cars, did not have to provide platforms at terminals, had no expense for ice, and no claims for spilled milk. From the standpoint of the plant the tank cars reached the city more regularly than trucks, less storage space was required at country stations, loading was done by mechanical means thus saving labor, and extra cars provided at the country plant saved storage tanks in the city plant.

## VETERINARY MEDICINE

**[Work in animal pathology at the Texas Station]** (*Texas Sta. Rpt. 1930, pp. 7–13, 14, 15, 136–141*).—In reporting upon the study of loin disease of cattle it is stated that the field work conducted by H. Schmidt was concluded and the laboratory closed. Satisfactory results were obtained in checking the bone chewing habit and reduction in losses through the feeding of bone meal. There were six times as many cases of loin disease and five times as many deaths from the disease among the control animals as among the animals fed bone meal. The losses from unknown causes were likewise about five times as high in the control animals as in the animals fed bone meal. Of the substitutes for bone meal that were tried, spent bone black was the only one that was voluntarily consumed by the animals without the addition of cottonseed meal. Dicalcium phosphate mixed with equal parts of cottonseed meal and salt and a commercial preparation known as Dicapho, also fed mixed with equal parts of cottonseed meal and salt, did not check the bone chewing habit when the calcium compound was fed in the amount of 3 oz. per day. Neither was the bone chewing habit broken when these two compounds were given as a drench for a year at the rate of 4 oz. per day. Tests with filtered loin disease toxin stored at refrigerator temperature or at room temperature showed that the toxin loses its potency more or less rapidly. Loin disease material stored at room temperature for 3 years still gave toxic cultures. The filtered toxin of such a culture in the tenth generation readily brought down a heavy beef animal with loin disease when injected with 0.75 cc. (the smallest amount tested). The fifth generation filtered toxin of this culture killed a heavy steer with loin disease when injected subcutaneously with 0.5 cc. The latter filtrate brought down a 110-lb. sheep with loin disease when injected subcutaneously with 0.1 cc. of the filtered toxin, while 2 White Leghorn cockerels injected subcutaneously, 1 with 0.5 cc. and the other with 1 cc. of filtered toxin, showed no effect.

In vaccination work with live cultures of infectious abortion, by Schmidt, O. C. Copeland, and [C. N.] Shepardson, 12.2 per cent of the 41 cows vaccinated and calving during the year aborted. While this was about double the percentage that aborted during the 4 years previous, it was only one-half of the abortion rate during the 10 years preceding the practice of vaccination with live cultures.

In reporting briefly upon a study of swellhead of sheep and goats by Schmidt and [E.] Jungherr, it is pointed out that, as noted on page 74, a typical jaundiced condition terminating in death can be produced by feeding lechuguilla. However, this same condition occurs in districts where the lechuguilla does not grow, indicating that the jaundiced condition may be due to some cause other than feeding upon the lechuguilla. The plant *Tribulus terrestris* was fed to goats for almost a month without clinical symptoms of swellhead developing, but at autopsy at the close of the experiment all the fat tissue in the body was found stained a deep lemon yellow.

In control work with stomach worms in sheep and goats very encouraging results were obtained by Schmidt and Jungherr from the use of a 1.75 per cent solution of copper sulfate plus 1 per cent Blackleaf 40 as a drench.

In work with loco poisoning by F. P. Mathews and Schmidt at Alpine, *Astragalus earlei* was the species found most prevalent producing the so-called locoed condition in both horses and cattle. In a survey made of the loco poison area by V. L. Cory, about nine varieties of loco weed were detected, only a few of which are sufficiently extensive to be of importance. *Astragalus earlei* was the most abundant and *A. wootoni* less abundant. A new variety, *A. argillophilus*, was identified.

Reports of losses among sheep due to bitterweed, *Actinea odorata*, led to experiments by Schmidt. It was found that where animals were force-fed by one method or another, as was necessary to secure consumption, they succumbed, indicating that this plant contains a substance poisonous to sheep.

In further studies of anaplasmosis (E. S. R., 63, p. 476) by Schmidt, blood from infected animals allowed to stand 11 and 13 days, respectively, produced no detectable reaction whatever when inoculated into an uninfected animal, while an animal inoculated with blood allowed to stand 10 days developed a body temperature on the twentieth day, although the parasite could not be detected in its blood. In an experiment in which blood was allowed to stand 8 days at room temperature before being injected into a susceptible animal, a marked rise in body temperature resulted, beginning 42 days after the inoculation.

Pink eye in sheep in the one outbreak observed was found by Schmidt to be infectious by direct transmission and by contact. In the first instance the period of incubation was 3 days and in the latter 17 days. In the single attempt made it could not be transmitted to goats.

Work at the Sonora Substation with swellhead of sheep and goats and sore mouth of kids and lambs, by Jungherr, W. T. Hardy, and W. H. Dameron; stomach worms of range animals, by Hardy and Schmidt; infectious keratitis in sheep (pink eye), by Jungherr; bitterweed, by Dameron, Hardy, and Cory; and goat louse and sheep scab, by O. G. Babcock, is further considered (pp. 136–141). The experiments show sore mouth of kids and lambs to be infectious, and seem to indicate that it is communicated more readily and in more severe form from kid to kid than from kid to lamb. Of the several dipping preparations tested during the course of the study of the goat louse only three were found to be reliable or efficient louse killers, namely, (1) pure sulfur and wettable sulfurs, 300 to 325 mesh, (2) Thylox gas sulfurs, 300 mesh and finer, and (3) Rotenen. In a study of the sheep scab mite in cooperation with the U. S. D. A. Bureau of Entomology it was found that this mite can not live beyond a 25-day period off the host. Nearly all the mites perished within 10 to 15 days, while in a very few instances live mites were reported up to 20 to 25 days after removal from the host. It was found that scab in certain instances at least may become apparently dormant during either extremely hot weather or during the cold winter months, only to break out again during the spring or fall months when optimum temperatures prevail. The standard dips—nicotine sulfate (Blackleaf 40) testing 0.07 nicotine and lime and sulfur testing 0.18—proved effective on a two-dipping schedule, provided the heads of the animals are thoroughly dipped and furthermore that the temperature of the dipping solution ranges between 105 and 110° F. The higher temperature is recommended for summer dipping while the lower one is suggested for colder weather.

**[Studies in comparative pathology in Japan]** (*Jour. Japan. Soc. Vet. Sci., 10 (1931), No. 2, pp. 57–132, pls. 5, figs. 9*).—The contributions here presented (E. S. R., 65, p. 568) are as follows: On a New Parasitic Nematode (*Eustrongylides tricolor* sp. nov.) in the Proventriculus of Formosan Domestic Duck, by M. Sugimoto (pp. 57–67, Eng. abs. pp. 66, 67); Biological Studies of Abortion Bacilli, with Special Reference to the Identification of the Bacilli and *Bacillus paratyphosus* B, by S. Suzuki (pp. 68–81); On the Correlation between the Smooth-Rough Variation and the Elementary Bacteriophage in *Bacillus suipestifer*, by K. Itabashi (pp. 82–99, Eng. abs. pp. 97–99); Studies on Contagious Pleuro-pneumonia in Cattle—VI, Comparative Studies among Complement-Fixation Test, Agglutination, Precipitinogen- and Precipitin-Reactions for the Diagnosis of Contagious Bovine Pleuro-pneumonia, by S. Ito, S. Yamagiwa, and K. Itabashi (pp. 100–116, Eng. abs. pp. 115, 116); An Unusually Severe Outbreak of Glanders in South Manchuria, by K. Okuda, T. Toyoshima, I. Mochida, Y. Sato, and S. Ijichi (pp. 117–127, Eng. abs. pp. 126, 127); and A Study of Lesions Caused by the Invasion of *Schistosomum turkestanicum* Skrj. in Cattle—Preliminary Report, by S. Yamagiwa (pp. 128–132, Eng. abs. pp. 131, 132).

**A sporulating anaerobic bacillus similar to the causal organism of black disease,** A. D. McEwen (*Jour. Compar. Path. and Ther., 44 (1931), No. 2, pp. 149–153*).—A description is given of a bacillus that has been isolated in four instances from the tissues of sheep which had died suddenly under circumstances where pathogenic anaerobic bacteria were suspected as the cause of death, although there was no history of recent parturition or of wounding. A bacillus similar to the *Bacillus oedematiens* type, held responsible for black disease, was isolated in three instances from a total of 5 sheep from Wales. The organism was isolated in one instance only from material from over 150 sheep from the Romney Marsh in Kent. It is pointed out that the findings suggest a peculiar local distribution of the microorganisms.

**Studies on sweet clover disease,** L. M. RODERICK and A. F. SCHALK (*North Dakota Sta. Bul. 250 (1931), pp. 56, figs. 9*).—This is a summary report of studies of sweetclover disease conducted at the station, earlier accounts of which have been noted (E. S. R., 59, p. 879; 61, p. 72; 65, p. 267).

Attempts to extract the toxic principle of the sweetclover have failed. It is considered unlikely that the coumarin (the lactone or inner ester of *o*-hydroxy-cinnamic acid) causes the disease unless it results from a decomposition product. The toxic property seems to be inactivated very slowly, if at all, by age. One hour's sterilization of the hay is insufficient for complete destruction of the toxic principle. The disease is evidently a form of complete intoxication rather than a primary infection. The chemical entity which has such a characteristic pathogenicity is still unknown. Nothing has been reported to suggest that moldy alfalfa or other feeds will cause this disease.

It is pointed out that "a highly successful treatment for sweetclover hemorrhage consists in the intravenous injection of 750 to 1,500 cc. of defibrinated normal bovine blood. No commercial hemostatic therapeutic agent of any value has been found, although the intravenous use of normal bovine serum has interesting possibilities. In making transfusions avoid if possible the use of blood of the other cattle fed on the same damaged hay which has resulted in the hemorrhage. It appears to be dangerous to attempt to use horse blood for therapeutic transfusion."

A list is given of 21 references to the literature.

**Contagious abortion** (*New Hampshire Sta. Bul. 256 (1931), pp. 23, 24*).—Control work with seven experimental herds of cattle near Durham by C. L. Martin has shown that contagious abortion can be handled by the blood test combined with a practical plan of sanitation and isolation of each of the groups of negative, positive, and suspicious reactors. Some animals from these seven herds were observed to maintain a natural agglutination, indicating suspicious reaction. In one instance a dam and two daughters held to this condition, indicating the possibility of this being a family trait in their case. The injection of neutral acriflavine, an aniline dye solution, into the blood stream of reacting animals failed to alter the reaction.

**Further studies on the relation of the milk agglutination titre to the elimination of Bact. abortus from the udder of the cow,** H. L. GILMAN (*Cornell Vet., 21 (1931), No. 3, pp. 243–251*).—In further work at the New York State College of Veterinary Medicine (E. S. R., 63, p. 772), milk from all four quarters of the udders of 113 cattle was examined for agglutinin content and inoculated into guinea pigs for evidence of *B. abortus* infection.

"Of the 113 animals, 108 had a blood titer of positive at 1:80 or higher, 5 showed a lower titer. *B. abortus* was recovered from the milk of 62.9 per cent of the animals showing a positive (1:80) blood titer and 78 per cent of those showing a positive (1:80) milk titer in one or more quarters. *B. abortus* was recovered but five times from milk showing a titer of less than positive at 1:80. The organism was recovered from 165 quarters, 36.9 per cent of all the quarters examined or 66.9 per cent of those with a complete reaction at 1:80 or higher.

"It seems probable that quarters showing agglutinins at 1:80 or higher are actively infected with the organism and may eliminate it at any time. Quarters showing agglutinins under 1:80 only in rare instances contain or eliminate the organisms. However, if this be true, 85 per cent of the animals in this series were udder infected inasmuch as 87 of the 108 positive cows showed agglutinins at 1:80 or higher in one or more quarters. Milk to be used for agglutination work must be from individual quarters, and not a composite sample from all four quarters. There does seem to be a considerable degree of correlation between the agglutination titer of milk and the presence of *B. abortus* in it."

**A note on the association of Bacillus abortus with suppurations in the horse,** H. W. BENNETTS and J. F. FILMER (*Aust. Vet. Jour.*, *7* (*1931*), *No. 2*, *pp. 74, 75*).—The authors report upon agglutination tests of the blood from (1) a horse affected with a chronic fistulous wither with a bilateral discharge, the horse having come from a dairy herd in which contagious abortion was present, and (2) from a second horse affected with a bursitis on the wither and with a much enlarged bursa on the poll which had not ruptured when the blood sample was taken. The sera from these animals were found to give positive agglutination reactions with a standard emulsion of *B. abortus* of bovine origin at 1 in 100 and 1 in 2,000 dilutions, respectively.

**On the persistency of the agglutination reaction for Brucella abortus,** F. B. HADLEY and W. E. WELSH (*Cornell Vet.*, *21* (*1931*), *No. 3*, *pp. 286–291*).—The tabular data presented show that within a period of two years a relatively large number of high titer reactors became low reactors, while a smaller number became nonreactors. On the other hand, all of the low titer reactors in the herd under discussion became nonreactors.

**Cultivation of foot-and-mouth disease virus,** M. C. and H. B. MAITLAND (*Jour. Compar. Path. and Ther.*, *44* (*1931*), *No. 2*, *pp. 106–113*).—This is a report of work conducted on behalf of the Foot-and-Mouth Disease Research Committee of the Ministry of Agriculture and Fisheries of Great Britain.

"The virus of foot-and-mouth disease rapidly became noninfective in tissue cultures of chick embryo tissue in hen plasma. This was not overcome by the addition of trypsin to the medium, nor was it related to changes in pH. It was probably evidence of a species peculiarity of chicken tissue and plasma. The virus has been cultivated through 17 successive cultures, in cultures of guinea pig embryo tissue in clotted guinea pig plasma. The tissues used were pads, lips, and tongue. Hairy skin appeared to be as satisfactory. Cultures of embryo kidney have in one instance permitted growth of the virus. Cultivation did not decrease the severity of the infection produced by the virus. Recovery from infection produced with virus from the eighth culture was associated with immunity against the strain of guinea pig adapted virus from which the culture virus originated.

"The amount of growth of virus in individual flasks was irregular. The maximum occurred most frequently after incubation for 3 and 4 days. Comparatively small amounts of virus served to initiate growth; an amount of virus in the cultures before incubation estimated as an infective titer of 1 in 4 sufficed. Virus has been subcultured after storage for 3 months at ±5° C. The virus frequently increased 1,000 times or more during 3 to 4 days' incubation. On one occasion it multiplied at least 10,000 times. Satisfactory cultures have been made by incubating 50 cc. of medium in a Roux bottle. The highest titer of virus observed in cultures was 1 in 100,000. There was no relation between the amount of growth of tissue in the cultures and the growth of virus. The addition of proteose to tissue cultures probably increased the amount of growth of virus. There was some evidence that the addition of glucose or trypsin to the medium might accelerate the rate of growth of the virus. Growth of the virus was not observed in tissue cultures of adult guinea pig kidney, although the virus survived as long in this medium as in cultures of embryo tissues in which it multiplied.

"Growth of the virus was not certainly obtained in a medium consisting of minced adult guinea pig kidney in serum and Tyrode's solution, although the virus survived as long in this medium as in tissue cultures in which it multiplied. This medium promotes the growth of vaccinia and some other viruses. Attempts were made to grow the virus in modifications of the medium without success. The survival of the virus in it appeared to depend on the survival of one or more undetermined functions of the tissue cells."

**A study of the subcutaneous lesion of cattle reacting to tuberculin,** W. H. FELDMAN (*Cornell Vet., 21 (1931), No. 3, pp. 268–285, figs. 4*).—The author has found that "in a certain percentage of subcutaneous lesions of cattle reacting to tuberculin there is present a constituent which is capable of inciting in the brains of rabbits a characteristic cellular response which resembles in its histologic aspects that which usually follows true tuberculous infection. The true character of the excitant and the exact significance of the cellular reaction is a matter of conjecture."

A list is given of 21 references to the literature.

**Studies on bovine mastitis.—IV, The occurrence in mastitis of haemolytic streptococci showing group similarity to Streptococcus pyogenes of man,** F. C. MINETT and A. W. STABLEFORTH (*Jour. Compar. Path. and Ther., 44 (1931), No. 2, pp. 114–125*).—This continues the studies previously noted (E. S. R., 64, p. 73).

"In a series of 113 cases of mastitis, previously reported and unselected except that they were showing pronounced clinical symptoms, 52 were found to be due to beta-hemolytic streptococci. In 39 instances these were of the kind commonly met with in mastitis. In the remaining 13 instances the streptococci were distinct from the usual udder streptococci and indistinguishable as a group by bacteriological and serological tests from *S. pyogenes* of direct human origin. The evidence therefore strongly suggests, though it can not be held to prove, that in these cases the streptococci had been implanted in the udder by the milker. In 7 of the 13 cases the organisms were present in large and predominating numbers, indicating that they were the cause of the mastitis.

"Notable features of these strains were their strong hemolytic properties and their high virulence for mice and rabbits. One strain produced small amounts of soluble toxin. In the more severe cases of streptococcus mastitis, strains with the characters described do not appear to be uncommon."

**A preliminary report on the pathology of sterility in heifers,** E. T. HALLMAN and A. L. DELEZ (*Cornell Vet., 19 (1929), No. 3, pp. 296–306, figs. 9*).—This is a contribution from the Michigan Experiment Station in which a study of the bacteriology and pathology of the reproductive organs and udder of five sterile heifers, three of which were reactors to the agglutination test for *Brucella abortus*, is discussed. The authors obtained *B. abortus* from the udders but not from the uteri or ovaries of the reacting heifers. "Well-marked lesions in the udders of the reacting animals are observed, but only slight or healed lesions are seen in the uteri. Degenerating follicles are present in the ovaries, but their significance can not be determined at this time. The two nonreacting heifers had been raised on oats and oat straw. There is some evidence of underdevelopment of the uterine mucosa and of the udder."

**Caseous lymphadenitis: The association of the bacillus of Preisz-Nocard with lesions caused by Oesophagostomum columbianum in sheep,** H. R. CARNE and I. C. ROSS (*Jour. Council Sci. and Indus. Research [Aust.], 4 (1931), No. 2, pp. 78–80*).—The authors' studies indicate that the *O. columbi-*

*anum* infestation in sheep is not an important complicating factor in any scheme for the control of caseous lymphadenitis.

**Contagious pneumonia in sheep,** N. DUNGAL (*Jour. Compar. Path. and Ther., 44 (1931), No. 2, pp. 126–143, figs. 4*).—An acute, infectious pneumonia of Icelandic sheep is shown by the author to be caused by an organism resembling Pasteurella. A description is given of the clinical and anatomical findings. The studies indicate that carriers play an important part in the spreading of the disease. Vaccination on a large scale was apparently successful. The biological character of the organism was studied, and its relation to the Pasteurella group is discussed.

**Lechuguilla fever of sheep and goats, a form of swellhead in west Texas,** E. JUNGHERR (*Cornell Vet., 21 (1931), No. 3, pp. 227–242*).—This is a contribution from the Texas Experiment Station on a disease of sheep and goats which occurs in some sections of the western range country of the State. The disease induces heavy losses at times and is feared because of its appearance without any warning. The prevailing form in the Pecos section of western Texas is a plant toxemia called lechuguilla fever, induced by feeding *Agave lecheguilla* to sheep and goats. It appears that there are also other range plants which have similar toxic properties.

This fever is characterized by general jaundice of the body tissues and morbid changes in the liver, it being primarily a functional incapacity of the liver. Pathologically, the disease is characterized by necrotic, necrobiotic, and sometimes cirrhotic, changes of the liver, accompanied by general icterus of hepatogenous origin. Lechuguilla fever, therefore, belongs to the group of enzootic liver diseases.

Control measures for lechuguilla fever should follow two main lines: Mechanical eradication of lechuguilla in at least one pasture, into which the animals can be thrown during the dangerous season; if this is not possible, eradication around watering places. A small amount of supplementary protein feed should be allowed regularly during the dangerous season. Sick animals brought from the range to feed lots are probably best treated with alfalfa hay and alkaline salts.

**Chronic infection of the udder of a goat with avian tubercle bacilli,** A. S. GRIFFITH (*Jour. Compar. Path. and Ther., 44 (1931), No. 2, pp. 144–148*).—The author's studies show that avian bacilli retained their cultural characteristics and specific virulence after a stay of five years in the body of a goat, during the greater part of which time they were multiplying in the udder.

**The application of the formol test to the diagnosis of hog-cholera,** F. M. HAYES (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 119 (1931), No. 5–6, pp. 336–339*).—The author finds that the formol reaction for dourine, glanders, and syphilis, previously described by others, does not appear to be of value in the diagnosis of hog cholera, since infected swine fail to react in a high percentage of cases and normal hogs may react.

**The etiology of epizootic encephalomyelitis of horses in the San Joaquin Valley, 1930,** K. F. MEYER, C. M. HARING, and B. HOWITT (*Science, 74 (1931), No. 1913, pp. 227, 228*).—An account is given of a peculiar disease of horses involving the central nervous system, scattered cases of which began to appear in parts of the San Joaquin Valley early in July, 1930. A gradually increasing number of cases was reported from most sections of this region throughout the month of August, the peak of the epidemic being reached the middle of September. With the onset of cool nights, the disease disappeared, no cases having been reported after November. It is estimated that a total of approximately 3,000 horses and mules succumbed to the disease or were sacrificed because of its sequelae, close to 6,000 equines having developed recognizable symptoms. About 50 per cent of these cases terminated fatally. At first the malady was quite generally diagnosed as equine botulism, but its spread suggested an infectious disease with an incubation period of from 1 to 2 weeks. Observations revealed febrile reactions preceding the onset of the symptoms which were manifest in the form of psychic and motoric disturbances.

"Signs of fatigue, somnolence, and occasionally excitability, were followed by incoordinated action of the limbs, disturbed equilibriums, grinding of the teeth, paresis, and paralyses which varied and were largely dependent on the lesions produced in the innervation centers of the nerves in the brain and the spinal cord. Inability to swallow, paralysis of the lips and bladder, amaurosis, etc., were quite common. In the mild cases which were able to rise, recovery was as a rule uneventful and without demonstrable sequelae, but about half were so severe that they terminated fatally in 3 to 8 days or became so obviously hopeless on account of the complications in form of decubitus, pneumonia, etc., that they were destroyed for humane reasons.

"Aside from a slight general icterus and moderately succulent lymph nodes and parenchymatous changes in the liver and kidneys, no gross anatomical lesions were found at autopsy. The spleen was not enlarged. As a rule the spinal fluid was slightly increased and showed 12 to 30 cells per centimeter, mostly lymphocytes and a few leucocytes. The brain and cord were moist and injected. . . . The distribution of the inflammatory foci differs from that commonly seen in typical Borna disease. Nuclear inclusions of the character described as typical of Borna disease by Joest and Degen were absent. Infiltrations in the lumbar plexus, semilunar, and other peripheral ganglia suggest a wide distribution of the virus.

"Blood cultures prepared from 10 horses were sterile, while the spinal fluid of 11 horses sacrificed or dead on account of encephalomyelitis gave cultures of hemolytic and nonhemolytic streptococci. Certain sections of the brain of a few horses (4 out of 10) contained the same organisms in small numbers. They were nonpathogenic for rabbits and horses on subdural and intravenous inoculation. They were considered secondary invaders without etiologic significance.

"Attempts were made to transmit the infection to rabbits by subdural and intracerebral injection of 20 per cent brain and cord suspensions. The animals failed to manifest definite symptoms. Although moderate febrile reactions of short duration were recorded, the rabbits recovered promptly. Suspensions of the central nervous system of 8 equines sacrificed at different stages of the disease were tested on horses by intraocular, intranasal, and intracerebral injections and feeding.

"The brain material from a case in the early stages of the infection produced on intraocular injection a fatal malady which was clinically indistinguishable from the San Joaquin Valley disease. Successive passages through horses, monkeys, rabbits, guinea pigs, rats, and mice, and reverse transmissions from these animals have as a rule been successful. Clinically as well as anatomically the experimental disease is an acute virus infection identical with the spontaneous equine encephalomyelitis. The infective agent has thus far been demonstrated in the central nervous system by experimental inoculation from two field cases. . . . Recent experiments indicate that the guinea pig is regularly susceptible for the horse virus and the most suitable animal for an extended study of the disease and its causative agent. . . . The virus survived in one experiment preservation at 4° C. in 50 per cent neutral glycerin for 12, 21, and 31, but not 105 days, when tested on horses and guinea pigs.

It is filtrable through Berkefeld V and N candles and retains its activity in a dilution of 1 : 1,000, although the incubation time may be slightly prolonged. The nature of the immunity of the horse is unknown. Sera of spontaneously recovered or resistant horses fail to neutralize the virus, while the sera of recovered rabbits, guinea pigs, and monkeys may contain antiviral substances."

**Newer knowledge of the neurotropic virus infections of the horse,** K. F. Meyer, C. M. Haring, and B. Howitt (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 3, pp. 376–389*).—The studies undertaken in connection with the epizootic of the disease noted above led to a renewed critical analysis of the descriptions of the diseases of this nature. The study conducted deals with the widely distributed outbreak of 1912 of so-called forage poisoning, so-called botulism, so-called enzootic cerebrospinal meningitis, Borna disease (which it is pointed out is not found in America). a second type reported in Germany, a disease reported from Argentina, encephalomyelitis in California, the absence of gross anatomical lesions, and transmissibility experiments, presented in connection with a list of 44 references to the literature.

**An infectious brain disease of horses and mules (encephalomyelitis),** C. M. Haring, J. A. Howarth, and K. F. Meyer (*California Sta. Circ. 322 (1931), pp. 14, figs. 15; also in North Amer. Vet., 12 (1931), No. 10, pp. 29–36, figs. 13*).—This practical account of the rapidly spreading disease of horses and mules which prevailed in the San Joaquin Valley and elsewhere in California in 1930 and 1931, as noted above, is accompanied by maps showing the occurrence of the disease in the State and illustrations of the symptoms as observed in the horse.

**Cryptococcus pneumonia in Equidae,** S. C. J. Bennett (*Jour. Compar. Path. and Ther., 44 (1931), No. 2, pp. 85–105, figs. 7*).—This is a summary of observations made in the Sudan on a hitherto unrecorded type of lesion caused by *C. farciminosus*, an apparently primary interstitial pneumonia. A brief description is given of the symptoms observed and the gross changes found on post-mortem examination, particular note being made of the tendency of the disease process to remain confined to the lungs. A more detailed account is then given of the pathogenesis as revealed by histological study. The relationship of the causal organism to others of the same type is discussed, and it is concluded that there is no reason to regard it as other than that responsible for epizootic lymphangitis, namely, *C. farciminosus*. Brief notes on the individual cases from which material has been studied are presented in an appendix.

**[Report of work of the New Hampshire Station in avian pathology]** (*New Hampshire Sta. Bul. 256 (1931), pp. 21–23, fig. 1*).—A brief account is first given of the results of post-mortem examinations made at the poultry pathology laboratory by C. L. Martin and C. A. Bottorff, 1,660 in number, which showed pneumonia and pullorum disease to have caused by far the greatest loss of chicks and coccidiosis the largest fatality among hens.

The occurrence of pullorum disease has decreased markedly in the 13 years that testing has been in progress, the losses which were as high as 60 per cent of all chicks hatched the year before the testing was commenced dropping to from 3 per cent to less than 0.5 per cent in the last 3 years. Only 18 per cent of the flocks tested during the year were found infected as compared with 27 per cent found infected the preceding year. In the eradication work with a flock of 769 birds with 13 original reactors was tested at monthly intervals until two clean tests were obtained the third and fourth months. A retest was made at the end of 10 months and another at the end of 16 months, the flock ranking 100 per cent clean each time. In none of the tests were birds saved that showed the slightest trace of an agglutination. The flock was reduced to 592 birds following the first retest, with 7 of those removed showing a strong reaction. The second retest cut the flock to 561 birds. Only two definite reactors were included among the birds removed and no birds following the third and fourth retests, which were both negative. All tests were checked by the standard tube method. In experimental work pullorum infection was discovered to have spread rapidly from a group of infected birds to clean birds that ranged with them. After the two groups had been together for 1 month the infection had spread to 1 per cent of the clean group; by 2.5 months the infection in the clean group was increased to 3 per cent. Two months later this had reached 4 per cent. An even greater spread was observed in the infected group, which showed a 9 per cent infection at the beginning of the experiment. One month later this infection spread to 20 per cent of the group. The next 1.5 months resulted in a gain of only 3 per cent, with no additional spread 2 months later.

The so-called stick method of vaccination for fowl pox, first described by Johnson (E. S. R., 62, p. 473) and tested on farms during the last 2 years by Martin and Bottorff, gave better results than did the older follicle method. With the assistance of A. E. Tepper three types of incision were tested—a stab, ⅛-in. incision, and ¼-in. incision—and all proved equally good.

**Fowl paralysis,** F. R. Beaudette and C. B. Hudson (*New Jersey Stas. Hints to Poultrymen, 19 (1931), No. 11, pp. 4*).—This is a practical account dealing with the cause, symptoms, and differential diagnosis of fowl paralysis, its incidence in New Jersey, mode of transmission, and means of prevention.

**Collyriclum faba as a parasite of poultry,** W. A. Riley (*Anat. Rec., 47 (1930), No. 3, p. 363*).—These data have previously been noted from another source (E. S. R., 65, p. 381).

**Vitamin requirements of intestinal nematodes,** J. E. Ackert (*Anat. Rec., 47 (1930), No. 3, p. 363*).—In the experiments conducted by the author, most of the chickens on deficient diets developed the typical deficiency diseases. Young *Ascaridia lineata* (Schneid.) were, however, able to grow as rapidly in these hosts as in those to which the vitamins A, B, and D were supplied, indicating that this nematode does not require any of these during the first third of its growth.

**Control of enterohepatitis in turkeys,** C. F. Schlotthauer and H. E. Essex (*Cornell Vet., 21 (1931), No. 3, pp. 252–255*).—The authors' observations indicate the advisability of maintaining newly hatched turkeys in battery brooders for two or more weeks in order to preclude the possibility of early infected turkeys spreading the disease to the entire group and contaminating the grounds.

## AGRICULTURAL ENGINEERING

**Irrigation districts, their organization, operation, and financing,** W. A. Hutchins (*U. S. Dept. Agr., Tech. Bul. 254 (1931), pp. 94, figs. 6*).—This supersedes Bulletin 1177 (E. S. R., 50, p. 186). It brings the information on irrigation districts for the 17 Western States down to December 31, 1928, with certain exceptions. The study on which it is based was conducted in cooperation with the California Experiment Station and the California State Department of Public Works.

It is pointed out that at the end of 1928, 801 irrigation districts had been formed in the 17 Western States, of which 407 were then operating, 10 were under construction, 82 were in preliminary stages, and 302 were inactive. The 499 active districts included 10,311,098 irrigable acres, of which 6,908,277 acres were in operating districts. On the whole, the district has proved better adapted to the improvement and extension of existing communities than to entirely new irrigation development.

Irrigation-district bonds aggregating $224,843,197 had been sold to the end of 1928. Of this amount 71 per cent were then in good standing. The situation with reference to bonds sold during the seven years ended with 1921 was less favorable in 1928 than in 1921, since one-fourth of such bonds in good standing in 1921 were delinquent at the end of 1928.

The principal reasons the delinquent districts have failed to meet their obligations have been the opposition of large and influential land owners to district organization, inclusion of unproductive lands, inadequacy of water supply, exploitation, engineering difficulties, and insufficient settlement of the land. The principal reason for defaults on bonds sold during the war period was insufficiency of reserve to carry districts through the postwar depression. The successful districts generally have been those formed to take over existing systems, to extend existing systems at costs which the lands could meet, to improve existing systems and provide supplemental water supplies, to cooperate with the United States on reclamation projects, and to build entirely new systems under particularly favorable circumstances.

Experience has shown the necessity for more extensive determinations of economic feasibility prior to district financing, and particularly for the inclusion in the cost estimates of a decidedly larger safety factor than was thought necessary 10 years ago. The bonding feature has been and still is susceptible of abuse.

**Run-off water losses in relation to crop production,** R. E. Dickson and D. Scoates (*Texas Sta. Rpt. 1930, pp. 51, 52*).—The progress results of this study indicate that rapidity of rainfall is a factor involved in losses of both water and soil, and that the greatest losses occur from torrential rains. The losses of water by run-off have not been in as direct proportion to the slope of the land as the losses of soil. Vegetative cover in the form of cotton, milo, and grass has been effective in conserving water, grass being the most effective. Tillage has been found to increase the absorptive power of the soil for water, as have also contoured rows and terraces. The results in general indicate that the use of contoured rows and closed level terraces will prevent run-off in the region. More detailed results of other features of the study have been reported in Bulletin 411 (E. S. R., 63, p. 116).

**Farm terracing,** C. E. Ramser (*U. S. Dept. Agr., Farmers' Bul. 1669 (1931), pp. [2]+22, figs. 20*).—This is a revision of and supersedes Farmers' Bulletin 1386 (E. S. R., 51, p. 684). It presents practical information on methods of preventing erosion, the design and construction of the Mangum terrace, and the construction of other types of terraces.

**Public Roads, [August, 1931]** (*U. S. Dept. Agr., Public Roads, 12 (1931), No. 6, pp. 145–180+[2], figs. 38*).—This number of this periodical contains data as to the status of Federal-aid and emergency road construction as of July 31, 1931, and an article on Studies of Paving Concrete, by F. H. Jackson and W. F. Kellermann.

**Effect of heating materials and appliances on the rate of hardening of rapid-hardening Portland cement,** N. Davey (*Concrete and Construct. Engin., 26 (1931), No. 6, pp. 359–364, fig. 1*).—Studies conducted at the Building Research Station in England are reported, in which it was found that the acceleration produced in the development of strength in rapid-hardening cement concrete in the first few hours by preheating the materials is striking. However, the acceleration is much more marked if the concrete after having been placed in a hot condition can subsequently be kept hot. It was found that samples of different brands of rapid-hardening Portland cements, and even separate consignments of the same brand, may vary considerably in quality, and it does not necessarily follow that an acceleration of strength due to mixing at a high temperature will always be realized. It was noted that when mixing at a high temperature considerably more water was required to produce a mix of the same consistency as one mixed at normal temperature. There appeared also to be a marked stiffening of the concrete during mixing.

**Hot cement,** N. Davey (*[Gt. Brit.] Dept. Sci. and Indus. Research, Bldg. Research Bul. 7 (1930), pp. III+9, pl. 1, figs. 2*).—Experiments on the effect of hot cement, meaning cement which is hot to the touch, are reported. Such cement becomes heated by friction during the process of grinding, and generally the finer the grinding the higher will be the temperature of the cement as it leaves the mills. The general conclusion is that the effect of using hot cement under ordinary structural conditions is unimportant.

**Predictions of 28-day tensile strength of sand mortars from 1-day information** (*Maine Technol. Expt. Sta. Bul. 27 (1931), pp. 42, figs. 2*).—This publication summarizes research extending over a period of 10 years and gives in detail the method of approach now in use at the station for predetermination of mortar strength.

The results show that the multiple coefficient of correlation for Maine sands is 0.822±0.021. It has been found that a 24-hour prediction of 28-day tensile strength of sands may be made within an average error of 42 lbs. per square inch, provided mechanical analysis data, percentage of mixing water, colorimetric test for organic impurities, and the four chemical constituents, iron, aluminum, calcium, and magnesium, are carefully determined.

**Built-up wood columns conserve lumber,** J. A. Scholten (*Engin. News-Rec., 107 (1931), No. 9, pp. 333–335, figs. 4*).—Tests conducted at the U. S. D. A. Forest Products Laboratory are reported, which indicate that laminated or built-up wood columns composed of lumber of small dimensions can be constructed having more than 75 per cent of the initial strength of solid columns of the same size. Individual columns of some designs were found to reach 90 per cent of that strength. No arrangement of laminations or kind of mechanical fastenings used in laminated columns gave results fully equal to those of solid sticks. Considering only the test results of columns with slenderness ratios of from 12 to 24, the small-sized columns of pieces assembled face to face gave about 33 per cent of the strength of a solid column. Tying the edges together with cover plates of such size as to have the moment of inertia practically equal about both axes increased the strength to about 66 per cent of that of a solid column.

In columns of larger size, the type having plain cover plates and a moment of inertia equal about both axes carried about 80 per cent of the load of a solid column, while columns with a solid core averaged slightly more than 80 per cent. It appears that these values apply only when the wood is well seasoned and the columns are built under engineering supervision. It was found that some of the load sustained by the built-up columns is due to friction. The most efficient columns are those least affected by moisture changes subsequent to assembly.

The two most promising types of built-up column were the solid core boxed with planks and laminations with cover plates.

**A. S. T. M. tentative standards, 1930** (*Philadelphia: Amer. Soc. Testing Materials, 1930, pp. 864, figs. 163*).—This volume contains 155 tentative specifications, methods of test, definitions of terms, and recommended practices with reference to materials of construction.

**A. S. T. M. standards, 1930.—II, Non-metallic materials** (*Philadelphia: Amer. Soc. Testing Materials, 1930, pt. 2, pp. 1214, pls. 5, figs. 167*).—This volume contains 251 standards, of which 248 are standards relating specifically to nonmetallic materials and 3 are standards of a general nature applying to both metals and nonmetals.

**Mechanical engineering laboratory practice,** C. F. SHOOP and G. L. TUVE (*New York and London: McGraw-Hill Book Co., 1930, pp. IX+488, figs. 185*).—This book presents information on laboratory practice as it applies particularly in connection with heat engineering. It contains chapters on mechanical measurements—methods and instruments; laboratory exercises; lubricants, friction, and lubrication; heat and heat transfer; properties of gases and vapors; the measurement of fluid flow; pumps and compressors; steam power generating units and auxiliaries; automatic regulation; refrigeration; and internal-combustion engines.

**Harvesting small grain, soybeans, and clover in the Corn Belt with combines and binders,** L. A. REYNOLDSON, W. R. HUMPHRIES, and J. H. MARTIN (*U. S. Dept. Agr., Tech. Bul. 244 (1931), pp. 55, figs. 12*).—The investigation upon which this bulletin is based was conducted cooperatively by the Bureaus of Agricultural Economics, Public Roads, and Plant Industry and the Illinois and Indiana Experiment Stations. It presents data on and makes comparisons between different harvesting methods, based on a survey of practice on a large number of farms in Indiana and Illinois, including the use of 107 combines.

It was found that the chief disadvantage of combine harvesting in the Corn Belt is the difficulty of obtaining the quantities of straw needed. The average rate of travel of combines in small grains and soybeans was 2.7 miles per hour and 1.8 in timothy and clovers. The average acreage of small grain harvested daily varied from 13 acres for the 8-ft. combines to 24 acres for the 12-ft. size. Lodging was the cause of some difficulty in combine harvesting, but in the majority of cases observed the combine gave better results than the binder in lodged grain.

**Life of farm machinery,** F. L. MORISON (*Ohio Sta. Bimo. Bul. 152 (1931), pp. 194, 195*).—Tabular data are presented on the probable life of the more common types of farm machinery obtained from about 40 farms in Medina and Greene Counties in Ohio. Data indicate that much of the operating equipment in use on these farms is approaching the average age at which it has been discarded in the past 11 years. The estimated average useful life of all machinery on these farms in 1920 was only 15 years.

**Rural electrification development in Idaho,** H. BERESFORD (*Idaho Sta. Bul. 180 (1931), pp. 84, figs. 103*).—A summary is given of the results of studies on the use of electricity in agricultural practices as conducted by the station in cooperation with the Idaho Committee on the Relation of Electricity to Agriculture. Section 1 gives a statement of the progress of rural electrification in Idaho, and section 2 describes the Idaho rural electrification project which was established at the Caldwell Substation farm. The studies deal with wiring, use of electricity in the farm home and dairy, silo filling, hay hoisting, feed grinding and forage processing, stock and poultry water heating, and the use of electricity in poultry production. A special section is devoted to the use of electricity for pumping for drainage and for supplemental irrigation, part of the studies of which were conducted in cooperation with the U. S. D. A. Bureau of Public Roads. A final section deals with new uses and methods for application of electricity to agriculture.

**The physical science of flour milling,** E. D. SIMON (*Liverpool: Northern Pub. Co., 1930, pp. 222, figs. 43*).—This book deals with the principles of flour milling engineering, with particular reference to the physical science underlying the design of the machinery necessary to clean the wheat berry and split it up into the desired products. Chapters are included on the field for development, separation according to dimensions, separation by air currents, dust collection, conditioning—scientific data, conditioning—the practical problem, tests for mill stocks, bran powder, purification, an analysis of the power required to drive a flour mill (paper read by the author in 1913) and a record of tests of the power consumed by various machines in roller flour mills (paper read by H. Simon in 1887). Several appendixes are included.

**Suggestions for the improvement of old bank dairy barns,** M. C. Betts and M. A. R. Kelley (*U. S. Dept. Agr. Circ. 166 (1931), pp. 35, figs. 34*).—This circular, prepared by the Bureau of Public Roads in cooperation with the Bureau of Dairy Industry, the Pennsylvania Experiment Station, and the Philadelphia Interstate Dairy Council, is based on a survey of conditions under which milk is produced in southeastern Pennsylvania.

It was found that many of the old bank dairy barns of the area must be improved in order that they comply with the housing requirements set up by regulatory authorities in large centers of milk consumption. The most serious objection to the old barns is the lack of light, ventilation, and cleanliness. Although few of these old barns could be improved at a reasonable cost, it was found that a large proportion of them may be remodeled so as to provide an abundance of clean water, fresh air, exposure to sunlight, protection from heat and cold, ample space for the stock, easily cleaned floors, and equipment to facilitate the care of cows. Considerable practical information is given in this connection.

**Farm electric milk refrigeration,** J. E. Nicholas (*Pennsylvania Sta. Bul. 267 (1931), pp. 39, figs. 9*).—The results of investigations are reported which indicate that milk may be cooled economically by electrically operated cooling plants. The economy of the milk cooling operation in such plants depends upon the method of handling the milk in the cooling process, the type of plant, the time of year, the construction of the cooler, the location of the plant, the temperature carried in the cooler, and the discharge pressure.

It was found that high temperature milk cooling water gives better performance than low temperature water. Lower performance was secured during the hot summer months from air-cooled condensing units. When the water is changed in a wet type cooler it requires approximately 0.2 to 0.28 kw. hour to cool 100 gal. of water 1°. The kilowatt-hours required to take care of heat leakages into a cooler depend on the time of the year, the maximum for summer being 2.7 kw. hours per 24 hours and for winter 0.589 kw. hour per 24 hours. Milk was found to cool more rapidly in the wet type cooler when the ratio of water to milk was large, and when agitation was employed. It was also found that milk cooling plants generally operate approximately 50 per cent of the time. Practical information on the construction and operation of milk cooling plants also is presented.

The results of laboratory milk cooling tests in which actual farm methods were duplicated as nearly as possible indicate that there is an advantage in the agitation of the cooling water if the morning milk is cooled less than two hours, and that agitation may be justified if rapidity and uniformity of cooling have any value. However, it is more expensive to cool milk when agitation is employed, and it is more expensive to maintain low temperatures in the cooling water.

**A study of factors affecting the efficiency and design of farm septic tanks,** E. W. Lehmann, R. C. Kelleher, and A. M. Buswell (*Ill. State Water Survey Bul. 27 [1928], pp. 45, figs. 25*).—This is a joint report by the Illinois Experiment Station and the Illinois State Water Survey. It reports the results of five years' investigations on (1) the amount and rate of sewage flow that a farm septic tank may be expected to care for, (2) the effect of the size of the tank on its efficiency for a given amount of sewage, (3) the relation of length, width, and depth of tank to efficient operation, and (4) the relative efficiency of single-chamber and multiple-chamber tanks.

The general conclusions are that inasmuch as the flow of sewage per person from farm homes is subject to wide variation, the tank should be so designed as to make an average allowance for sewage flow of from 18 to 25 gal. per person per day, depending upon the size of the family. Ordinarily it is not practical to build a tank smaller than the size required for seven people.

In a single-chamber tank a 72-hour retention period should be provided. In a two-chamber tank a 72-hour retention period should be provided in the first chamber and an additional retention period of 36 hours in the second chamber (capacities being in the ratio of 2:1, or a total retention period of 108 hours). When properly designed, the two-chamber tank is more efficient than the one-chamber tank, particularly if the two-chamber tank is provided with 50 per cent larger capacity, as recommended above.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**[Investigations in agricultural economics at the Ohio Station]** (*Ohio Sta. Bimo. Bul. 152 (1931), pp. 192, 193, 196*).—Two articles are noted.

*The chattel mortgage situation in Union County, Ohio*, V. R. Wertz, (pp. 192, 193).—The recorded mortgages increased from 349, totaling $105,747, in 1910 to 2,659, totaling $1,130,075, in 1929 and 2,324, totaling $957,474, in 1930. The tendency of chattel mortgage loan companies since their development to require mortgages on a major portion of the borrower's chattels to secure small loans has increased the total number and total amount of chattel mortgages recorded by compelling sellers of implements and other chattels to secure debts which were formerly unsecured. The sources of chattel loans in 1930 were as follows: To farmers, banks 35.7 per cent, finance companies 15.4, motor sales companies 13.3, implement dealers 10.3, insurance companies 0.5, and miscellaneous 24.8 per cent; and to city and village residents, banks 54.8 per cent, motor sales companies 14.1, finance companies 10, and miscellaneous 21.1 per cent.

*Index numbers of production, prices, and income*, J. I. Falconer, (p. 196).—The data previously noted (E. S. R., 65, p. 678) are brought down through June, 1931.

**[Investigations in agricultural economics at the Texas Station, 1929–30]** (*Texas Sta. Rpt. 1930, pp. 67–74*).—Results not previously noted are reported as follows:

Continuing the study of local cotton marketing (E. S. R., 60, p. 186), L. P. Gabbard and W. E. Paulson found that during the 1929-30 season the average prices on the five markets studied varied from $83.59 to $94.87 per bale and were closely related to the average quality of the cotton on the markets. The average differences per bale between central market values and the local prices were $1.57, $2.36, $4.16, $4.69, and $2.86, respectively.

Tables, prepared by Gabbard, are included showing for Collin County, by years 1915–1929, the average sale prices, assessed values, total tax per acre, and the yearly percentage changes of farms for which bona fide sales were recorded. While the average annual tax per acre varied from 1924 to 1929 only from 78 cts. in 1924 and 1926 to 85 cts. in 1928 and averaged 82 cts., the ratio of taxes to income increased from 11.8 in 1924 to 24.5 in 1926 and decreased to 18.7 in 1929. The income per acre, deducting all expenses including taxes and interest paid, decreased from $5.46 in 1924 to $1.87 in 1926, then increased from $3.42 in 1928, and decreased again to $2.90 in 1929. In the case of 177 bona fide sales studied in 1929, the assessed values ranged from 15 to 118 per cent of the sales price, averaging 34.2 per cent.

**The outlook for the dairy industry** (*U. S. Dept. Agr., Misc. Pub. 124* (*1931*), *pp. IV+60, figs. 41*).—This is a slightly revised edition of a publication previously noted in mimeographed form (E. S. R., 65, p. 81).

**Planning the farm business on three dairy-fruit farms in Massachusetts,** R. L. Mighell (*Massachusetts Sta. Bul. 275* (*1931*), *pp. 89–115, figs. 5*).—Analysis is made of the farming systems of three neighboring dairy-apple farms—a 1-man farm with 11 cows and 150 bearing trees, a 2-man farm with 16 cows and 250 bearing trees, and a 3-man farm with 21 cows and 1,000 bearing trees. Tables and charts show for each farm the present farming system, receipts, expenses, and a man labor distribution under the present organization, and the estimated receipts, expenses, and man labor distribution under suggested plans of reorganization.

**Studies in economics of apple orcharding.—I, An apple enterprise study—costs and management,** H. C. Woodworth and G. F. Potter (*New Hampshire Sta. Bul. 257* (*1931*), *pp. 71, figs. 21*).—This is the first of a series of bulletins based on a detailed study of 10 fruit farms in 1926, 12 in 1927, and 9 in 1928. The orchards included in 1927 varied from 503 to 4,315 trees. In making comparisons between orchards, three units were used—actual yield, expected normal yield, and mature tree equivalent. The methods of computing the last two are described and their advantages and disadvantages discussed. The orchard organization and management of the several orchards are described and tables included showing the costs, man labor, horse work, and truck and tractor use for each in pruning, spraying, brush disposal, fertilizing, soil management, thinning, propping, setting trees and grafting, protection, harvesting, grading and packing, and miscellaneous.

The management problem was found to hinge largely on the organization for spraying, which requires skilled labor and expensive equipment for very definite short intervals. Intensive detailed pruning beyond that necessary to assure a strong mature tree of reasonable height was not found profitable. The sod mulch system was found to be exceedingly economical.

The number of man hours per 1,000 mature trees varied from 872.4 to 3,950.4, averaging 2,215. The total estimated costs prior to harvest, not including land, trees, and overhead, varied from $1,144.16 to $4,246.39, averaging $2,128, per 1,000 mature trees; from $164.39 to $697.51, averaging $355.97, per 1,000 boxes normal yield; and from $119.07 to $538.53, averaging $323, per 1,000 boxes actual yield. Labor requirements for harvesting were approximately equal to the total prior to harvest. Grading and packing required about the same time. The estimated net cost prior to harvest, including use of land and appreciation and depreciation of trees, was $514 per 1,000 boxes normal yield, or $466 per 1,000 boxes actual yield.

**The organization and financial returns of 129 small sized Louisiana cane farms, 1930,** G. H. Reuss (*Louisiana Stas. Bul. 224* (*1931*), *pp. 39, figs. 6*).—The business organization and financial statements for the 1930 season were obtained from 37 farms in Vermilion and St. Martin Parishes, 61 in Iberia and St. Mary Parishes, and 31 in Assumption, Ascension, and Iberville Parishes.

From 76.6 to 82.6 per cent of the farms included in each of the three groups were owned by operators, and from 53.1 to 67.9 per cent of the acreage was in crops. Tables are included showing for each of the three groups and for all farms the classification, utilization, and tenure status of the land; average investments, by items; crop organization; receipts and expenditures; and net cash and labor incomes. The factors affecting net income are discussed with tables showing (1) the average net cash and labor incomes of farms with plus and minus incomes, the farms being grouped by size, percentage of crop land in cotton, truck, and cane, and different total labor expenses per crop acre and different number of crop acres worked per man up to harvest; (2) the gross income and expenses of the farms with different percentages of crop land in cane; and (3) the relation of yield to average net cash income per crop acre and the average labor income per crop acre with plant and stubble cane.

The study showed that while the average receipts from crop sales and labor expense varied in the three areas, the average net cash and labor incomes did not vary greatly. Seventy-one per cent of the 129 farms made positive cash incomes, and the average for all farms was $4.38 per acre. While 30 per cent made enough to pay depreciation, family labor, and interest on capital invested, the 129 farms lacked on an average $4.50 per acre of paying such charges. Size of farm showed little effect on net income per acre. Any considerable proportion of the crop acreage in cotton was associated with a decrease in both net cash and labor incomes. Truck crops in the eastern area made a relatively large cash return per acre, but as the acreage in truck was small the return on the farm basis was low. Labor and cash incomes increased as the percentage of crop area in cane increased up to approximately 50 per cent. Labor expenses per acre and crop acres per man both indicated that labor efficiency is an important factor affecting profits. Yield of cane per acre was the most important factor affecting income.

**An economic study of the hop industry in Oregon,** G. L. Sulerud (*Oregon Sta. Bul. 288 (1931), pp. 77, figs. 24*).—The geographic distribution of hop growing; the world, national, and regional trends in production and yields; the State, district, and county trends in production in Oregon; acreage distribution on farms, varieties and yields, soil types, and capital outlay and costs in the State; and the trends in foreign trade and consumption of hops are analyzed and discussed. Special attention is given to the analysis of prices paid Oregon growers, the comparative prices in domestic and foreign markets and in the markets of neighboring States, seasonal prices, contract prices, and grading and standardization. The situation and outlook for the industry in Oregon are discussed. A selected bibliography on hops is included.

World production declined very materially during the World War, and although it has made rapid recovery it is still appreciably below that of 1905 1914. Oregon production decreased from 21,000,000 lbs. in 1915 to 3,500,000 lbs. in 1918, increased to 18,445,000 lbs. in 1929, and again decreased to 15,630,000 lbs. in 1930. The trend in Oregon was definitely upward as compared with California and Washington, there being a decline in the former and a stationary or only slightly increasing tendency in the latter State. Prices of hops adjusted for changes in the general price level have tended downward since 1909–1913. Little was found in the foreign market situation that would promise profitable expansion of Oregon production, and the hop trade feels that no sudden change will take place in the United States consumption in the near future. Attention is called to the importance of attaining a high standard of market quality in order to meet foreign competition.

**Cost of producing rice in Arkansas in 1927,** O. J. Hall (*Arkansas Sta. Bul. 266 (1931), pp. 47, figs. 8*).—This study analyzes the investment and costs in 1927 for labor, farm power, water, materials, and overhead in producing rice, and shows the combination of such costs on the most efficient and the least efficient farms studied. It is based on a survey made of 74 farms with 13,243 acres of rice harvested. Tables and graphs are included and discussed showing both the average costs of different items for all the farms and the averages for different items for the farms grouped according to tractor time per acre, cost of irrigation water per acre, rice acreage, cost of tractor power and horse work per hour, etc., and comparing the investments, costs, expenses, and incomes on the 20 low cost farms and the 20 high cost farms. The factors affecting costs, effect of yields and prices on returns to management, and the relation of costs to farm labor income per acre are discussed.

The total average cost of production was $42.49 per acre, or 80 cts. per bushel, as follows: 25.1 hours of man work, $10.04; 4.09 hours of tractor work, $3.52; 10.6 hours of horse work, $1.87; irrigation water, $10.55; seed, taxes, automobile, insurance, twine, etc., $7.38; interest, $7; depreciation, $2.03; and miscellaneous, 10 cts. Tractors were used on an average of 367.4 hours at an average cost of 86 cts. per hour, and work stock 448.81 hours at an average cost of 18 cts. per hour. The lowest costs were obtained on the group of farms using 2–2.99 tractor hours, 11.6 horse hours, and 21.2 man hours per acre. With more than 2 tractor hours per acre, the number of man hours increased and there was no corresponding decrease in the number of horse hours. Cost of water per bushel increased as the cost per acre increased. The average investment per acre was for land and buildings $143.82, machinery $15.11, livestock and poultry $3.81, and feed and supplies $1.18, total $163.92. The total cost per acre, including payment of family labor, averaged $34.26 for the 20 farms with lowest costs and $55.71 for the 20 with highest costs.

Higher yields tended to increase cost per acre somewhat, but decreased cost per bushel. Average costs per acre and per bushel tended to become less as the area in rice increased up to 250 to 299 acres. Low total costs centered in efficiency of operation, being increased on many farms due to too much work stock being kept, horses and tractors being used too few hours, lack of efficient irrigation equipment, and too high capital investment.

**Cost of wheat production by power methods of farming, 1919–1929,** J. G. Klemgard and G. F. Cadisch (*Washington Col. Sta. Bul. 255 (1931), pp. 24, figs. 9*).—This bulletin presents the record of one operator using the system followed by many larger scale wheat growers in the Palouse country, Wash. The special characteristics of the area, the farming systems used, and the factors affecting cost in different years are described, and the costs in the individual years are analyzed, and charts are included showing the average costs for the entire period and each 2-year period (except 1927).

The average total costs varied from 75 cts. per bushel in 1927 to $1.66 in 1919–1920, averaging 90.3 cts. for the 11 years. Of the average total costs, 39.5 per cent was rent, 11.7 labor, 10.5 depreciation, 8.9 gasoline and oil, 6.5 repairs, 7.3 grain sacks, 6 interest, 4.2 seed, 2.7 food for hired help, 1.5 taxes, and 1.2 per cent insurance. The average selling price varied from 86 cts. per bushel in 1921–1922 to $1.90 in 1919–1920 averaging $1.077. The profit or loss per bushel ranged from a loss of 7 cts. in 1921–22 to a profit of 28 cts. in 1927, averaging 17.4 cts. profit for the period.

The possibilities for lowering production costs in the Palouse region are discussed.

**Supplement to Crop Reporter** (*U. S. Dept. Agr., Crop Reporter, 15 (1913), No. 6, Sup., Apr., 1931, pp. 8*.—This supplement to the Crop Reporter previously noted (E. S. R., 29, p. 493) includes crop reports released during June to August, 1913, inclusive, but not published heretofore.

**The taxation system of Virginia,** R. A. Ballinger (*Virginia Sta. Bul. 279 (1931), pp. 22, fig. 1*).—The sources of tax revenue, constitutional provisions regarding taxation, and the provisions of the different tax laws of the State are described.

**Taxation and public-school finance in Colorado,** G. S. Klemmedson (*Colorado Sta. Bul 376 (1931), pp. 38, figs. 11*).—This is a popular bulletin describing the tax situation in the State, the general trend in expenditures for public education, the school situation, and the weakness of the present system of financing schools, and discussing methods for reducing the tax burdens on farmers for schools and bringing about a balanced tax system and a more equitable distribution of the costs of education.

Federal, State. and local taxes take 8.4 per cent of the net annual income of all the people of the State. Of the 1928 State and local taxes, 50 per cent was used to support public education. Counties and local school districts paid 97 per cent of the cost of education. Increase of the State levy on general property for school purposes is not deemed advisable, as such a tax falls heaviest on farmers and ranchmen. A graduated income tax, plus some form of special taxation with a distribution of part of the new revenue to heavily burdened localities, is recommended, together with a plan by which the State will guarantee to each community a minimum educational program under which $1,000 per classroom unit of 28 pupils will be expended, the funds to be raised by a 2-mill local levy, a 3-mill county levy, and the balance to be paid by the State from income and nonproperty taxes.

**Membership problems in farmers' cooperative purchasing associations,** J. K. Stern (*Pennsylvania Sta. Bul. 268 (1931), pp. 38, figs. 5*).—This bulletin is based on data secured by interviews with 192 members and 353 nonmembers of 6 cooperative purchasing associations in the eastern half of Pennsylvania. Included are tables showing the attitude of the two classes of farmers toward the organizations as indicated by their answers to various questions. The six associations studied are described, and their organization and the attitude of members and nonmembers are discussed. The farmers interviewed were rated as to the degree of cooperation evidenced by their attitudes and experiences.

Of the members, 58 per cent talked to neighbors about their organization, 43 per cent inquired about prices before buying through the cooperative, 92 per cent believed the cooperative had lowered farm supply prices, 81 per cent that the abandonment of the organization would result in a rise of such prices, 3 per cent that an injustice was done dealers by buying through the cooperative, 92 per cent liked the cash-at-car-door method of selling, 3 per cent thought the cooperative should extend more credit, and 72 per cent were satisfied with the service of the association. The percentages for the nonmembers were 13, 87, 50, 41, 7, 09, 9, and 64, respectively. Twenty-five per cent or less of commodities handled by the cooperative were made through the cooperative by 17 per cent of the members and 60 per cent of the nonmembers, from 26 to 50 per cent by 14 and 16 per cent, from 51 to 75 per cent by 11 and 5 per cent, and 76 per cent or over by 58 and 19 per cent, respectively. Of the members interviewed, 4 per cent were rated as noncooperators, 27 per cent as poor to fair cooperators, and 69 per cent as real cooperators. For the nonmembers, the percentages were 39, 41, and 20. respectively.

**The play and recreation of children and youth in selected rural areas of South Carolina,** M. E. Frayser (*South Carolina Sta. Bul. 275 (1931), pp. 67, figs. 12*).—This study, undertaken to ascertain the social, recreational, religious, and educational (other than day school) opportunities for youth in typical rural environments and to ascertain to what extent and how such opportunities were being taken advantage of. is based on data obtained by visits to the homes, both owner and tenant, of 617 white and 337 negro young people and children in four counties. Of the records, 715 were obtained in the study previously noted (E. S. R., 63, p. 187) and 239 in 1931. The social and economic factors—size of family, percentage of tenancy, size of farms, types of farming, and modern conveniences—of the areas are described. Tables and charts are included and discussed showing for white young people of owner and nonowner families, grouped by ages and sex, the number participating and the average number of hours per week of participation in different kinds of entertainments, games, different kinds of music, secular organizations, seasonal activities, miscellaneous activities, reading of different kinds, educational and business interests of different kinds, and attendance at church, Sunday school, and church meetings. Other tables, charts, and text cover the same field for the negro families.

The hours per week devoted to leisure activities of the 617 white young people increased quite uniformly from 16.25 hours for the 6- to 9-year-old group of boys to 22.75 hours for the 14- to 21-year-old group. For girls the increase was from 17.5 to 25.5 hours. The study showed but few indications of leisure time being used harmfully, but that much time was employed unprofitably. There was but little evidence of social planning by and for the community, and the need of active leadership was apparent, although potential leadership seemed to exist.

**Rural community fire departments**, W. C. NASON (*U. S. Dept. Agr., Farmers' Bul. 1667 (1931), pp. II+46, figs. 15*).—A summarization is made of the results of a field survey in which 80 rural fire departments were covered, case studies made of 52 departments, and information secured locally concerning 18 others. Data were also obtained indirectly regarding more than 100 other departments. The methods of financing and types of rural fire departments are discussed with descriptions of a number of departments, including such factors as origin, ownership, control, finance, organization, equipment, and use. The important points in methods of procedure in the organization of rural fire protection are summarized.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**The International Institute of Agriculture: An historical and critical analysis of its organization, activities, and policies of administration**, A. HOBSON (*Calif. Univ. Pubs. Internatl. Relat., 2 (1931), pp. XI+356*).—This monograph by the American representative on the permanent committee of the institute from 1922 to 1929 is divided into five parts, dealing, respectively, with the founding of the institute, organization and program, administrative procedure and methods of control, the institute in its external relations, and some conclusions and a few recommendations. It is stated to be "an attempt to analyze existing shortcomings, with a view to exhibiting the forces that have brought them about. It is hoped that such an analysis will contribute to a better understanding of the action that must be taken and the improvements that should be made if the institute is to perform the services that it is expected to render."

"The treatment of the subject is admittedly critical. . . . The International Institute of Agriculture has a great field of usefulness," but it "has failed in fulfilling its mission." As to the future, the author concludes as follows:

"Service to agriculture holds the key. Acceptable service requires a technical staff working under the direction of an efficient and scientific administration responsible in the fullest measure to an international control. The treaty establishing the institute permits of these essentials. Their absence is largely the results of violations of both the letter and spirit of this valuable document. In the treaty, agriculture has a magna charta. By its terms governments solemnly pledge themselves to cooperate in promoting its welfare. It behooves the agricultural interests of all nations to demand that the institute be conducted in a manner that will translate this pledge into an effective force."

**List of technical workers in the Department of Agriculture, and outline of Department functions, 1931** (*U. S. Dept. Agr., Misc. Pub. 128 (1931), pp. IV+165*).—This is the usual annual list and outline (E. S. R., 64, p. 280).

**Experiment stations and other institutions, official and private, engaged in the development and improvement of agriculture in warm regions** (*Stations Expérimentales et autres Institutions Officielles ou Privées s'occupant du Développement et de l'Amélioration de l'Agriculture dans les Pays Chauds. Rome: Inst. Internatl. Agr., 1931, pp. 166*).—This publication lists over 800 institutions in 76 countries. In many cases brief notes as to their organization, area, and field of operation are included.

**Organizing for rural home-talent tournaments**, D. E. LINDSTROM (*Illinois Sta. Circ. 376 (1931), pp. 15, figs. 6*).—This is a popular circular describing kinds of tournaments, methods of organizing for music and drama tournaments, the functions of officers and directors, the time and effort required, and the by-products of tournaments.

## FOODS—HUMAN NUTRITION

**Use of whole wheat in the kitchen**, H. H. and C. C. FINNELL (*[Oklahoma] Panhandle Sta., Panhandle Bul. 30 (1931), pp. 12–15*).—Directions are given for the home preparation of hard red winter wheat for use in cooking, with tested recipes for products considered particularly successful. In the experimental work upon which these recipes are based, an average quality of grain was selected, testing 60.7 lbs. per bushel and with a protein content of 12.1 per cent. Recleaned and smut-free grain was used, and the wheat was further cleaned by stirring thoroughly in cold water to bring the chaff and dust to the surface, pouring off the water, and repeating the process several times. For some of the recipes the whole wheat as thus cleaned is boiled in an open kettle until tender, with the addition of one level teaspoonful of salt to each quart of wheat and enough water to keep the grains covered throughout the boiling period. When the grains are tender, the water is drained off thoroughly and the cooked wheat ground in a household food chopper, using the finest burr. In this condition the cooked wheat is referred to as prepared whole wheat. From it a dry breakfast cereal can be prepared by spreading the freshly ground material in a 1-in. layer on a flat pan and drying in an oven at low or moderate temperatures until crisp.

Recipes in which the prepared whole wheat is used include dishes prepared with cheese and with fresh or canned vegetables, whole wheat patties, and whole wheat custard pudding. A recipe is given for macaroons in which the home prepared breakfast cereal is used.

Directions are also given for the use of coarsely ground wheat, as prepared in the ordinary feed mill, for cooked cereal and for baking powder bread. By using fine burrs in grinding, a fair grade of flour can be prepared for use as a whole wheat flour.

"It is not intended to suggest that a family could live satisfactorily on a diet of whole wheat, but it is undoubtedly possible for home prepared whole wheat in some form to enter into each meal of the day without risking monotony if the dishes are judiciously selected. As long as wheat remains near 25 cts., per bushel, farm price, there are few economies that can be as effective as using it in the farm kitchen."

**Cooking cured pork,** L. M. ALEXANDER and F. W. YEATMAN (*U. S. Dept. Agr. Leaflet 81 (1931), pp. 8, figs. 4*).—This leaflet, in the series noted previously (E. S. R., 62, p. 90), contains general directions for cooking hams and other cuts of cured pork and special directions for baked ham, boiled ham, ham cooked under steam pressure, boiled smoked boneless shoulder butts, broiled, baked, and fried ham slices, roast stuffed cured shoulder, salt pork and bacon, and various dishes prepared from ground cooked ham.

**Making frozen delicacies at home,** P. H. TRACY (*Illinois Sta. Circ. 377 (1931), pp. 16, figs. 7*).—The foreword to this circular makes a plea for the greater consumption on the farm of milk and cream in the form of ice cream and other frozen delicacies "at a time when the market price for whole milk and butterfat is low in comparison with the prices of other food commodities." The ingredients used in ice cream are listed, and directions are given for the various steps in the preparation and freezing of the ice cream mix and in packing the ice cream, with a discussion of various types of freezers on the market. Formulas are given for making plain vanilla ice cream from coffee cream, coffee cream and evaporated milk, and coffee cream and sweetened condensed milk, with suggestions for variations of the standard formula for different varieties of ice cream. Formulas and recipes are also given for various ices and sherbets, for ice creams frozen without stirring, and for fancy ice cream with the use of molds.

**The White House Conference on Child Health and Protection, November 19–22, 1930: [Sect. II, Public Health Service and Administration].—Preliminary report of the committee on the economic aspects of milk** (*U. S. Dept. Agr., Bur. Dairy Indus., 1931, pp. 42, figs. 4*).—This preliminary report is made up of brief reports from the various subcommittees as follows: Communicable diseases transmitted through milk, by S. J. Crumbine, V. A. Moore, and L. P. Brown; the public health supervision of milk, by L. C. Frank, C. O. H. Laughinghouse, and F. C. Wilson; the nutritional aspects of milk, by E. V. McCollum, F. W. Schlutz, and J. A. Tobey; and the economic aspects of milk, by O. E. Reed, C. E. Gray, and F. Howe.

The report of the subcommittee on the nutritional aspects of milk contains a brief summary of present knowledge concerning the nutritional value of milk and recommendations for further research along various lines. Among the topics suggested are the following: Studies on curd tension to obtain further confirmation of the value of soft curd milk in infant feeding and to determine the feasibility of rendering all milk soft-curded by suitable homogenization; studies on the vitamin B and G content of milk correlated with accurate determinations of the nutritive needs of the young for these vitamins; metabolism studies on children to determine the optimum proportion of milk in the diet; fundamental research on the composition of human milk and means of improving its quality; studies to determine the possible significance of the inorganic elements occurring in minute amounts in milk; and studies on the supplementary relation of casein to other heat-coagulable proteins of milk and on the nutritive qualities of whey and whey powder.

**Growth and reproduction on milk diets,** J. WADDELL, H. STEENBOCK, and E. B. HART (*Jour. Nutrition, 4 (1931), No. 1, pp. 53–65, figs. 4*).—The authors, with the cooperation of E. VanDonk, have extended their observations on the nutritional behavior of rats on diets of whole milk supplemented with copper and copper and iron salts to cover long continued growth and reproduction.

On a diet of whole milk supplemented with copper in amounts up to 1 mg. per 100 cc. of milk or 1 mg. per rat per day, chronic anemia resulted and growth and reproduction were below normal. Some of the young were reared, however, and third generation animals were secured. On a diet of whole milk supplemented by 1 mg. of iron and 0.5 mg. of copper per 100 cc., no anemia resulted, but growth and reproduction were still subnormal. No specific evidence of low vitamin B or E were observed. The subnormal growth and poor rearing of the young were attributed to deficient caloric intake on account of the inability of the animals to handle large enough amounts of fluid. Subnormal reproduction of the female rats was attributed to late sexual maturity and poor ovulation. Preliminary experiments indicated that the addition of small amounts of either manganese or iodine or both greatly improved the ovulation rhythm in the females on the milk, copper, and iron diet.

**Male sterility on milk diets,** J. Waddell (*Jour. Nutrition, 4 (1931), No. 1, pp. 67–77, figs. 6*).—This paper reports a histological study conducted by the author, with the cooperation of E. VanDonk, of the testes of male rats rendered sterile by the diet of milk, copper, and iron in the above study. The sterility was found to be characterized by the complete disappearance of the germinal epithelium, great loss in the amount of testicular tissue, and pronounced edema. It is thought that the sterility is not caused by low vitamin E, but is apparently intensified by the action of the ferric chloride used as the source of iron.

**The rôle of diet in the cause, prevention, and cure of dental diseases,** M. T. Hanke (*Jour. Nutrition, 3 (1931), No. 4, pp. 433–451*).—In this review the author traces the history of the various theories which have been advanced since the time of Hippocrates to explain the origin and cure of dental diseases, and discusses these theories in the light of present knowledge concerning the normal and pathological structure of the oral tissues. Among the more recent theories which are discussed at some length are those of Höjer (E. S. R., 57, p. 295), Mellanby (E. S. R., 63, p. 391), Bunting et al. (E. S. R., 64, p. 392), and Boyd, Drain, and Nelson (E. S. R., 62, p. 595). The author's own experience in the dietary treatment of pyorrhea is included. A list of 26 references to the literature is appended.

**The influence of bulk in the diet upon fecal calcium and phosphorus,** L. Ascham (*Jour. Nutrition, 3 (1931), No. 4, pp. 411–420*).—To determine the possible effect of bulk on the utilization of calcium and phosphorus, dogs were kept in a state of negative calcium balance on synthetic diets differing only in the kind and amount of roughage. Cellulose flour was used as roughage in five experiments and agar in two. Four adult, female fox terriers were used throughout the entire investigation and one adult, female mongrel for part of the time. Calcium and phosphorus determinations were made on 6-day samples of the urine and feces and nitrogen determinations upon 3-day samples of urine.

The summarized data show wide fluctuations not only for the different dogs, upon the same diet but also for the same dog upon the different diets. The average values for each diet were more consistent in showing higher values for fecal calcium and phosphorus on the high than on the low roughage diets. The effect of the agar was more marked than of the cellulose flour. The evidence, although not altogether conclusive, is thought to indicate that bulk may increase the fecal excretion of both calcium and phosphorus.

**Seasonal variation in the rate of growth of pre-school children,** H. McKay and M. A. Brown (*Ohio Sta. Bul. 482 (1931), pp. 33, fig. 1*).—This is the complete report of a 3 years' investigation noted previously from progress reports (E. S. R., 64, p. 693). During the entire period 173 records were obtained, including 23 covering a period of 2 years, 68 one year, and 59 from 2 to 11 months. This gave 114 records complete for 1 year and 173 which were used for determining monthly gains or losses.

The monthly records showed the average gains in weight to be lower for March and April and higher for October than for any of the other months. This was true for both boys and girls. Grouping the months of May to October, inclusive, as the summer season, and from November to April, inclusive, as the winter season, the average monthly gains for the 3 consecutive years were 0.48 and 0.24 lb., 0.56 and 0.44, and 0.47 and 0.3 lb. for the summer and winter seasons, respectively. Of the individual children, 85 made their greatest gains during the summer season and 29 during the winter season. Of the 23 children observed over a 2-year period, 14 made a greater gain in summer than in winter, in both years and 21 during at least 1 of the 2 years. It is considered of significance that 20 of the 29 children for whom increases in weight were greater in the winter than in the summer had been in nursery schools during the winter months, while in the summer their afternoon naps were shortened or eliminated entirely. This is thought to indicate that "any advantage which may possibly be inherent in one season over another may be overshadowed by environmental factors within the control of those who have the care of the child."

With the exception of the girls from 4 to 5 years of age and the boys from 3 to 4 years of age, the average gains in weight were higher than the expected gains as calculated from the Holt standards. The individual gains were not as favorable, however. Only 52 per cent of the entire number made or exceeded the expected gain in the first year, 77 per cent in the second, and 62 per cent in the third year. In comparison with the Woodbury standards the records were better for both the group and individual children.

The gains in height showed less uniformity than those in weight as far as season was concerned. February seemed to be the month of smallest gain in height for both boys and girls and November the month of greatest gain for the boys and August for the girls. There appeared to be no special correlation between periods of most rapid gains in weight and in height. The average gains in height by groups exceeded the Holt standards for every group except the boys of 3 to 4 years of age. The proportion of individual children making or exceeding the expected gains in height was larger than of those making or exceeding the expected gains in weight.

Various factors influencing the growth of children are discussed with reference to the data reported. Of these, the effect of food habits has been noted from another source (E. S. R., 64, p. 894). Other factors considered are health habits, sunshine and hours spent out of doors, prevalence of illness, and weather conditions.

The general conclusion drawn is that there is a decided tendency toward a seasonal variation in the rate of growth in weight of preschool children, but that seasonal variations in increases in height are insignificant. "This may indicate that as far as increases in height are concerned, environment is less of a factor than is the case with increases in weight. In other words, the less favorable environment of winter does not depress the impulse of growth upward as it depresses increases in weight. From this it may be reasoned that with environmental conditions as good in winter as in summer, the rate of growth during the winter season would be equal to that of the summer season."

**The association of vitamin A with greenness in plant tissue.—III, Vitamin A content of asparagus grown under light of various qualities, J. W. Crist and M. Dye** (*Jour. Biol. Chem., 91 (1931), No. 1, pp. 127–134, fig. 1*).—In continuation of the investigation noted previously (E. S. R., 61, p. 494), the authors have determined the vitamin A content and the chemical composition of asparagus grown under four glass filters of known limits of transmission, in the open, and in the open but covered with soil to prevent access of light. The technic for the vitamin A studies was essentially the same as in the earlier investigation. The chemical analyses included quantitative determinations of chlorophyll, amino acids, water-soluble nitrogen, and the inorganic elements calcium, iron, manganese, phosphorus, and potassium.

Of the various factors studied, the content of chlorophyll showed the closest relationship to the content of vitamin A as determined by the average growth responses of rats receiving 0.1 gm. of the asparagus as the source of vitamin A. This relationship, however, was not linear in character. Beyond the point G 55 A, representing the asparagus grown under the filter transmitting rays between 325 and 580$\mu\mu$, the growth of the animals in proportion to the chlorophyll content lessened and finally dropped sharply with respect to the asparagus grown in the open. "This course of the curve could be interpreted as a progressive diminution of the dominance of chlorophyll as the limiting factor and, at last, the ascendency of other factors as limiting when chlorophyll is fully ample and no longer the limiting factor. The environal conditions (data taken but not presented) under which the tips in the open grew were much different from those which obtained in the closed frames. Besides the full sunlight outside, both the temperature and relative humidity averaged considerably lower."

The authors call attention to the theory of Bezssonoff that vitamin A is a sensitizer of chlorophyll and hence a conditioner of chlorophyll formation, and assert their belief that the opposite is true. "It seems reasonable to conclude that within the restrictions of the two variables expressed by some nonlinear relationship chlorophyll content is a limiting factor on vitamin A synthesis in the vegetative parts (in this case the stem tip) of the plant."

**The unsaponifiable lipids of lettuce.—I, Carotene,** H. S. Olcovich and H. A. Mattill (*Jour. Biol. Chem., 91 (1931), No. 1, pp. 105–117, figs. 4*).—Essentially noted from a preliminary report (E. S. R., 64, p. 588).

**Further experimental differentiation of vitamins B and G,** H. C. Sherman and M. R. Sandels (*Jour. Nutrition, 3 (1931), No. 4, pp. 395–409, figs. 7*).—This paper reports in greater detail the studies on the sparing solubility of vitamin G in alcohol and the effects upon rats of varying degrees of a deficiency in this vitamin (E. S. R., 61, p. 592), and includes comparable feeding experiments with rats to measure the solubility of the antineuritic vitamin B in alcohol of 80 per cent concentration by weight.

The extracts were prepared from air-dry bakers' yeast, 0.8 gm. of which furnished enough of either vitamin B or G for good growth. The 80 per cent alcohol extract corresponding to this amount of yeast, concentrated on the water bath to remove the alcohol, when fed as the source of vitamin B induced as good growth as the original yeast for about 20 days, after which the curve flattened out. It is suggested, in view of later developments, that this may have been due in part to a relative shortage of the Reader thermolabile vitamin possibly destroyed at the temperature of the water bath. "Should further investigation confirm this suggestion, the vitamin B ($B_1$) of yeast would then appear somewhat more soluble in alcohol, as is also suggested by the fact that the residue here showed extremely little of this vitamin."

Solubility studies for vitamin G were extended to alcohol of 95 and 60 per cent concentration by weight. On account of the possible destruction of the vitamin in the extracts by heating and drying, the residues only were fed. Growth at increasing rates resulted when the sources of vitamin G were the residues from 60. 80, and 90 per cent alcohol, respectively, thus indicating that the solubility of vitamin G in alcohol of 95 per cent concentration by weight is negligible but increases with the dilution of the alcohol. The only curve showing any flattening, suggesting that one of the more recently discovered vitamin B factors might have been to a slight extent a joint limiting factor with vitamin G, was the one on 60 per cent alcohol by weight. Commenting upon these results, the authors state "the experiments here described were made during the year 1927–28. In the light of work more recently published from other laboratories, or still in progress in our own, we should note with special care (1) that the nature of the material extracted, as well as the precise conditions of applying the solvent, should be taken into account in all statements regarding solubilities of vitamin G, and (2) that all extracts of wheat used as vitamin G-poor sources of vitamin B in this laboratory are made with alcohol of at least 80 per cent by weight, 84 per cent by volume, or stronger."

Observations on the effects of vitamin B and G deficiency in the rat are discussed. Lack of appetite is thought to be a characteristic of lack of vitamin B, but not of G. Attention is called to differences in symptoms produced by complete and partial lack of vitamin G. These are illustrated by excellent photographs of rats suffering from partial and complete deficiency of this vitamin. "Whether the observed variability of symptoms of the G-avitaminosis is connected with multiple nature of vitamin G is a question still under investigation."

**Anorexia characteristic of lack of the vitamin B complex: The rôles of the individual components**, E. Burack and G. R. Cowgill (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 7, pp. 750–752*).—To determine which constituent of the vitamin B complex is responsible for appetite stimulation, 15 dogs were maintained on an artificial food mixture consisting of highly purified casein (Harris), sucrose, butterfat, lard, salt mixture, and bone ash and when the appetite failed were given 10 test materials to stimulate it. The materials, with total number of tests and number of effective tests for each, were as follows: Fuller's earth adsorbate 46 and 12, tikitiki 10 and 10, autoclaved yeast 11 and 0, fuller's earth adsorbate and autoclaved yeast 53 and 32, whole yeast 36 and 35, yeast vitamin powder (Harris) 6 and 6, milk vitamin concentrate 9 and 7, fuller's earth adsorbate and milk vitamin concentrate 7 and 7, Vitavose 7 and 7, and tomato juice 14 and 13, respectively.

The 100 per cent effectiveness of tikitiki and zero effectiveness of autoclaved yeast are thought to rule out vitamin $B_2$ as having any stimulating effect on the appetite. The failure of some of the other materials to restore appetite in all cases is thought to suggest the possibility that another substance, not vitamin G, is required to supplement the antineuritic factor in this respect.

**Some effects of the vitamin B complex on appetite and on utilization of food**, C. E. Graham and W. H. Griffith (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 1086–1088*).—In this preliminary report, data are summarized on the effect of various sources of vitamins $B_1$ and $B_2$ on the rate of growth, consumption of food and water, and utilization of food in rats. The Evans and Burr vitamin B-free diet (E. S. R., 59, p. 489) was used, supplemented daily with 9 drops of cod-liver oil and some source of the vitamin B complex. Four groups received, respectively, 0.5 gm. of whole dried yeast (high $B_1$—moderately high $B_2$), 0.5 gm. yeast plus 0.5 gm. whole dried hog liver (high $B_2$—low $B_1$), 0.15 gm. yeast plus 0.85 gm. liver, and 5 drops tikitiki plus 0.1 gm. autoclaved liver (high $B_2$) as the vitamin B complex supplement to the basal diet which was restricted to the same calorie level in each group. Other groups received the basal diet ad libitum, with the same supplements.

The gains in weight of the animals of the first four groups (restricted food consumption) were surprisingly uniform. In the corresponding groups receiving the basal diet ad libitum, the only one in which growth approximated that of normal stock rats was the one receiving 0.5 gm. of yeast plus 0.5 gm. of liver. Other supplements on which growth was subnormal included 1 gm. of liver and 5 drops of tikitiki plus 0.2 gm. of autoclaved liver. Additional supplements resulting in growth equal to or at a greater rate than that on the stock diet were 0.5 gm. of yeast plus 1 gm. of autoclaved liver and 5 drops of tikitiki plus 1 gm. of autoclaved liver. Since the supplements furnishing both $B_1$ and $B_2$ were more effective than those furnishing either one alone, the authors conclude that "the influence of the antineuritic vitamin ($B_1$) on appetite may not be as specific as was suggested by Sherman and Sandels [above]. Burack and Cowgill [above] concluded from experiments on dogs that either the antineuritic vitamin was the sole appetite factor or another substance, not vitamin G ($B_2$), was required to supplement the antineuritic factor. Our own experiments emphasize the importance for normal appetite of both the antineuritic vitamin and another factor which is found in autoclaved liver."

**Dietary requirements for fertility and lactation.—XXIII, The specific effect of vitamin B on lactation, B. Sure and D. J. Walker** (*Jour. Biol. Chem., 91 (1931), No. 1, pp. 69–75, figs. 3*).—In this continuation of the series of papers noted previously (E. S. R., 64, p. 293), lactation records in the form of weight curves of total litters are given for paired rats on the same diet, with and without an abundance of vitamin B, one of each pair receiving autoclaved yeast and the other untreated yeast. The amount of the diet was limited to that voluntarily consumed by the one receiving autoclaved yeast. Positive controls were included for lactating rats on the same diet ad libitum with untreated yeast.

The curves representing the lactation records of the three animals in each group demonstrated conclusively that vitamin B has a favorable effect upon lactation quite apart from its influence on food consumption. The poorest records were those of rats receiving no vitamin B. The records were considerably better for those receiving the same amount of basal ration but plenty of vitamin B, and best of all for those receiving plenty of vitamin B and the basal ration ad libitum.

**The auto-oxidation of fats with reference to their destructive effect on vitamin E, M. J. Cummings and H. A. Mattill** (*Jour. Nutrition, 3 (1931), No. 4, pp. 421–432*).—Attention is called in a brief review of the literature on the subject to the apparent relation between the auto-oxidizability of fats and sterility in animals on rations containing these fats. In order to study this relationship further, the comparison was undertaken of the reproductive behavior of rats on diets containing various fats with the susceptibility of these fats to oxidation, as determined by the method of Greenbank and Holm (E. S. R., 54, p. 111), and on the amount of water-soluble oxidizable substances present in the fats, both fresh and after exposure to oxidation, as determined by the modified Issoglio procedure as described by Kerr and Sorber (E. S. R., 52, p. 712). The fats were tested singly and in mixtures.

The individual fats tested, in order of decreasing auto-oxidizability, were cod-liver oil, lard, butterfat, and cottonseed oil, with hydrogenated vegetable fat and stearin showing no tendency toward auto-oxidation. When the fats were mixed they tended mutually to influence the auto-oxidizability of the mixture. "Thus, as an example, the induction period of a mixture of lard and cod-liver oil (ration 230) was approximately 9 hours. The presence of 2 gm. of wheat germ oil in this mixture prolonged the induction period beyond 24 hours. Again, the induction period of cottonseed oil was reduced from 75 hours to 21 hours by the addition of 2 gm. of cod-liver oil. Cottonseed oil contains some antioxidant, as its induction period and unpublished observations indicate, but not a sufficient amount to counteract the pro-oxidizing activity of cod-liver oil with the result that in combination both oils were oxidized, the one more slowly, the other more rapidly, than alone. When 2 gm. of wheat germ oil were added to this combination, the induction period was lengthened to 30 hours. The amount of antioxidant was still inadequate to compete with the oxidizing activity of cod-liver oil. Wheat germ oil is itself auto-oxidizable, and when its antioxidant is exhausted its own oxidation increases the volume of oxygen consumed."

The results of tests for the water-soluble oxidizable substances in the fats did not exactly parallel those for auto-oxidizability, since the former depends upon the number and character of the double bonds and the latter upon the accelerating or inhibiting substances present. "The induction period of lard was shorter than that of cottonseed oil, while the water-soluble oxidizable products of cottonseed oil were more abundant than those of lard. Hydrogenated vegetable fat and stearin were equally inactive in absorbing oxygen, but after exposure to oxygen the latter contained unexpected amounts of water-soluble oxidizable products whose precursors probably account for the shortened induction period of a mixture of butter and stearin over that of butter alone. It is again apparent that the presence of wheat germ oil may delay auto-oxidation and the formation of oxidizable products, but when the exposure to oxygen and heat outlasts the retardation provided by its antioxidant even larger amounts of oxidizable products may be formed than would be in the absence of wheat germ oil."

In the feeding experiments, the reproductive behavior, as indicated by the numbers of litters, the frequency of resorptions, and the weights of the testes, showed that the hydrogenated cottonseed oil-butter combination was the most successful and the stearin-butter and lard-cod-liver oil combinations the least successful, with mixtures of cottonseed oil with butter and with cod-liver oil and hydrogenated cottonseed oil with cod-liver oil intermediate.

These results are discussed in their relation to the nature and function of vitamin E, with the suggestion that the physiological activity of vitamin E may reside in its antioxygenic property. Various papers are cited as presenting data which might thus be interpreted.

**Vitamin E in iron treated dry rations,** J. WADDELL and H. STEENBOCK (*Jour. Nutrition, 4 (1931), No. 1, pp. 79–93*).—The authors, with the cooperation of E. VanDonk, have extended their investigation of the destructive effect of ferric chloride on vitamin E (E. S. R., 61, p. 95) in order to determine if possible the mechanism of this destruction.

The earlier conclusion that the ration induces 100 per cent sterility in female rats was confirmed, and it was also demonstrated that the ration produces sterility in male rats as well.

The explanation of Evans and Burr (E. S. R., 58, p. 494) that the harmful effect upon vitamin E of certain fats is due to the presence of antivitamin substances led to an attempt to isolate similar substances from the iron-treated ration. When this was extracted with ether, the iron removed from the extract, and the extract added to a ration known to contain vitamin E, fertility was not secured. Similar failure was observed in the use of wheat germ plus some of the washed extract of the iron-treated ration as the source of vitamin E. Further evidence of the formation of antivitamin was furnished by feeding the iron-treated ration to female rats with large bodily stores of vitamin E. As long as the ration was being fed the rats remained sterile, but when it was replaced by a basal vitamin E-free ration containing no iron, fertility was gradually restored. This is thought to indicate that the antivitamin apparently does not destroy vitamin E in the body, but simply renders it ineffective.

Attention is called in an addendum to the studies of Cummings and Mattill noted above, in which they have shown that oxidation of the fatty constituents of the diet destroys vitamin E and that this oxidation is quite extensive in certain common fats and oils. "It follows, therefore, that the amount of vitamin E in any diet is markedly influenced by the balance between anti- and pro-oxygenic substances. It is very probable that what we have termed antivitamin is pro-oxygenic in character. Regardless of what name is applied, it is apparent that it has a profound effect not only in the ration, but also in the body of the rat."

**The effect of large doses of irradiated ergosterol upon the ash content of the femora of young and adult rats,** J. H. Jones and G. M. Robson (*Jour. Biol. Chem., 91 (1931), No. 1, pp. 43-56*).—The authors take exception to the conclusion of Hess, Lewis, and Rivkin (E. S. R., 62, p. 590), Light, Miller, and Frey (E. S. R., 62, p. 792), and Brown and Shohl (E. S. R., 63, p. 695) that activated ergosterol if administered in very large amounts withdraws calcium from the bones. This conclusion was based in each case on the observation that the percentage of ash in the bones of growing rats was less in those animals receiving toxic amounts of irradiated ergosterol than in the bones of those receiving either a stock ration or a diet supplemented with nontoxic doses of vitamin D. It is pointed out that no account was taken of the possibility of a difference in the increase in the percentage of ash in the growing bones during the experimental period. Since this would presumably not be true of adult rats, fully grown rats were given toxic doses of irradiated ergosterol and suitably matched controls of the same litter and sex were given the same amount of the basal ration as consumed by the experimental animal, but without ergosterol. The experiment was continued for 11 or 12 days unless the animal receiving irradiated ergosterol died earlier. If this happened the control was killed immediately. On autopsy histological studies were made of the various organs and the femurs were analyzed for ash content.

In the animals receiving the high dosage of irradiated ergosterol, the ash varied from 58.74 to 66.7 per cent, with a mean of 62.6 per cent, and in the controls from 59.32 to 65.46 per cent, with a mean of 63.36 per cent. Similar experiments with growing rats showed in some cases a slight decrease in the relative amounts of ash in the femurs of those receiving large doses of irradiated ergosterol, but no detectable decrease in absolute amount. The authors conclude that "irradiated ergosterol in extremely toxic doses has no specific action which results in actually withdrawing calcium salts from bone comparable to its ossifying action when given in therapeutic doses."

**Simple methods for metabolic balance studies and their interpretation,** E. Donelson, B. Nims, H. A. Hunscher, C. F. Shukers, and I. G. Macy (*Jour. Home Econ., 23 (1931), No. 3, pp. 267-272*).—This discussion, which is based upon six years' experience in human metabolic work in the laboratories of the Merrill-Palmer School and the Children's Hospital of Michigan, includes "the technic of conducting a metabolic balance observation with a comparison of the computed and chemically determined values for the same dietaries, a consideration of balance figures with an attempt to discriminate between significant results and those falling within the range of experimental difference, and the influence of periods of varying lengths on the final balance figure."

A list of 24 references to the literature is appended.

## TEXTILES AND CLOTHING

**The testing of yarns and fabrics,** H. P. Curtis (*London and New York: Isaac Pitman & Sons, 1930, 2. ed., pp. XII+186, figs. 60*).—In the second edition of this book (E. S. R., 56, p. 496), "much of the original matter has been revised and several more pages added, giving recent methods of testing, together with the necessary illustrations of the new instruments."

**Textiles on test,** J. G. Williams (*London: Chapman & Hall, 1931, pp. VIII+194, pls. 40, figs. 14*).—This manual, intended as a study for the distributor and consumer of the wearing and washing properties of fabrics and garments, discusses the general characteristics of fabrics and yarns; textiles and color in wear and wash; washing, laundering, and dry cleaning; and complaints from customers.

**Dresses for little girls,** C. L. Scott (*U. S. Dept. Agr. Leaflet 80 (1931), pp. 8, figs. 7*).—This leaflet of the series noted previously (E. S. R., 64, p. 97) gives suggestions as to style, construction, materials, and trimmings for practical but attractive dresses for little girls.

## MISCELLANEOUS

**Report of Moses Fell Annex Farm, Bedford, Indiana, June, 1931,** H. J. Reed and H. G. Hall (*Indiana Sta. Circ. 183 (1931), pp. 24, figs. 20*).—The experimental work summarized in this report is for the most part abstracted elsewhere in this issue.

**Agricultural research in New Hampshire, 1930: Report of the New Hampshire Agricultural Experiment Station,** J. C. Kendall (*New Hampshire Sta. Bul. 256 (1931), pp. 27, figs. 8*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1930. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

**Forty-third Annual Report [of Texas Station], 1930,** A. B. Conner et al. (*Texas Sta. Rpt. 1930, pp. 168, fig. 1*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1930, and for the various State funds for the fiscal year ended August 31, 1930. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

**The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [September-October, 1931]** (*Ohio Sta. Bimo. Bul. 152 (1931), pp. 153–199, figs. 9*).—In addition to several articles noted elsewhere in this issue, this number contains Receipts of Produce on the Columbus Wholesale Market, 1930, by C. W. Hauck (pp. 189–191).

# NOTES

**Arizona University and Station.**—Dr. P. S. Burgess has been appointed dean of the College of Agriculture and director of the station.

**Georgia University and Station.**—Under an act of the legislature which became effective January 1, the separate boards for the various branches of the State university system have been abolished. In their stead a single board of regents composed of one member from each of the 10 congressional districts of the State, one member at large, and the Governor of Georgia ex officio will control the College of Agriculture, the station, and other units in the system.

**Hawaii College Station.**—Dr. Carroll P. Wilsie has been appointed agronomist.

**Missouri University.**—The enrollment in the College of Agriculture is 485, as compared with 365 in 1930, and exceeds that at any time since the World War.

**New York State Station.**—E. L. Green, associate in research (chemistry), has resigned to accept a position with the U. S. D. A. Bureau of Plant Industry, effective November 15, 1931.

**Virginia Truck Station.**—Dr. H. H. Zimmerley, horticulturist, resigned October 31, 1931, to accept a position in the U. S. D. A. Bureau of Plant Industry.

**Wisconsin Station.**—The division of agricultural chemistry has been awarded a grant from the American Medical Association for the study of the distribution of phosphorus in rachitic and normal blood.

**Association of Official Agricultural Chemists.**—This association held its forty-seventh annual meeting in Washington, D. C., November 2-4.

Substantially the usual program as to sectional meetings was followed, but an important innovation was introduced of including in the general sessions addresses by authorities in some of the newer fields of chemical research. The opening speaker under this arrangement was Dr. H. C. Sherman of Columbia University, who discussed the relationship of vitamins to problems of nutrition and the growing importance of these substances to agricultural chemists and food chemists charged with regulatory activities. Dr. Sherman pointed out that the term " vitamin rich " should be used in advertising with discrimination, as so-called vitamin rich foods may be grossly lacking in the essential vitamins A, C, and G, though containing a sufficient quantity of vitamins B, D, and E, and commercial irradiation with ultra-violet light increases only the vitamin D supply. He indicated that official chemists must be prepared to evaluate the amounts of these vitamins in food and drug products and made a plea for the training of qualified workers, though he recognized that not every laboratory need be equipped for full service in this field.

In a discussion of Special Applications in Methods of Agricultural Chemical Analysis, Dr. C. A. Browne of the U. S. D. A. Bureau of Chemistry and Soils advocated a broadening of the scope of the association's work to provide fuller information regarding many materials, such as cellulose and lignin in feeding stuffs. Biological methods, in his opinion, needed further attention from the group, particularly those employing enzymes.

The presidential address of H. D. Haskins of the Massachusetts Station dealt mainly with the early history of control work with fertilizers, especially the beginning of fertilizer analyses in Massachusetts. The changing viewpoints in control activities by employing as far as possible cooperation with manufacturers in the elimination of undesirable conditions were also depicted.

In the absence of the Secretary of Agriculture, an address of welcome was given by Assistant Secretary R. W. Dunlap.

Officers for the ensuing year were elected as follows: President, A. E. Paul of Chicago, Ill.; vice president J. W. Kellogg of Harrisburg, Pa.; secretary-treasurer Dr. W. W. Skinner of Washington, D. C. The executive committee includes these officers, together with H. D. Haskins, R. Harcourt of Guelph, Ont., Dr. F. C. Blanck of Washington, D. C., and H. H. Hanson of Dover, Del.

**Association of Land-Grant Colleges and Universities.**—In addition to the general officers enumerated on page 5, the following section officers were elected at the Chicago meeting, November 16–18, 1931: Agriculture, B. H. Crocheron of California, chairman, R. Y. Winters of North Carolina, vice chairman, and J. F. Cox of Michigan, secretary; engineering, D. S. Kimball of Cornell University, chairman, and Paul Cloke of Maine, secretary; and home economics, Jessie W. Harris of Tennessee, chairman, and Margaret S. Fedde of Nebraska, secretary. In the section of agriculture, the subsection of experiment station work elected W. W. Burr of Nebraska, chairman, and U. P. Hedrick of New York, secretary; the subsection of extension work C. E. Ladd of Cornell University, chairman, and R. K. Bliss of Iowa, secretary; and the subsection of resident teaching C. Larsen of South Dakota, chairman, and E. J. Kyle of Texas, secretary.

In the standing committees the following appointments were announced for 3-year terms: In the committee on instruction in agriculture, home economics, and mechanic arts, Ruth A. Wardall of Illinois, E. C. Brooks of North Carolina, and H. L. Shantz of Arizona vice Edith P. Chace of Pennsylvania, S. B. Earle of South Carolina, and H. L. Kent of New Mexico; college organization and policy, M. G. Neale of Idaho and H. S. Boardman of Maine vice R. S. Shaw of Michigan and E. G. Peterson of Utah; experiment station organization and policy, L. E. Call of Kansas and F. J. Sievers of Massachusetts vice C. A. Mooers of Tennessee and W. L. Slate of Connecticut; extension organization and policy, P. H. Ross of Arizona and C. A. Keffer of Tennessee vice A. E. Bowman of Wyoming and I. O. Schaub of North Carolina; military organization and policy, J. R. Turner of West Virginia and B. Knapp of Alabama vice F. L. McVey of Kentucky and A. M. Soule of Georgia; engineering experiment stations, H. S. Rogers of Oregon vice C. A. Lory of Colorado; the radio problem, H. J. C. Umberger of Kansas and R. C. Higgy of Ohio, the former by reappointment and the latter vice J. J. Tigert of Florida; aeronautics, W. L. Bevan of Iowa and E. B. Norris of Virginia (reappointments); joint committee on projects and correlation of research, H. W. Barre of South Carolina vice T. P. Cooper of Kentucky; and joint committee on publication of research, C. G. Williams of Ohio vice F. B. Morrison of Cornell University. The committees on cooperation with the Federal Farm Board and the National Advisory Committee on Education were continued unchanged, but that on land-grant institutions for negroes was reorganized on a permanent basis with E. C. Brooks of North Carolina to serve for 3 years, W. C. John of Washington, D. C., for 2 years, and H. F. Cotterman of Maryland for 1 year. R. M. Hughes of Iowa succeeded E. C. Brooks of North Carolina as a delegate to the American Council of Education.

**American Society of Agronomy.**—This society held its twenty-fourth annual meeting in Chicago, Ill., on November 19 and 20.

The presidential address of Dean and Director W. W. Burr of Nebraska University and Station was entitled Some Contributions of Agronomy to the Development of the Great Plains. The remainder of the program, aside from committee reports and other business, included sectional programs in soils and crops, mainly on the usual symposium plan. The soils section met jointly with the American Soil Survey Association for a consideration of soil organic matter and soil classification, and later took up the relation of calcium and magnesium compounds to soil conditions and plant growth and various miscellaneous topics. The crops program dealt with cold and drought resistance in plants, soybeans, and other topics.

The society gave extended consideration to a plan for reorganization submitted by a committee headed by M. F. Miller of Missouri. Under this plan as adopted the name of the society and its journal are continued unchanged. Sections of soils and crops are to be organized within the society, each of which has the privilege of creating subsections as desired. The annual meeting is to include one or more general sessions in addition to the sectional programs. As regards membership, honorary members, fellows, and active and associate members are provided for.

The officers will include a president, a vice president automatically succeeding to the presidency and to be selected alternately from the sections of soils and crops, and a secretary-treasurer and editor to be appointed by the executive committee. For the ensuing year, however, officers were elected under the previous plan, with Dr. P. E. Brown of Iowa as president, Dr. S. A. Waksman of New Jersey, Dr. George Stewart of Utah, R. I. Throckmorton of Kansas, and M. A. McCall of the U. S. D. A. Bureau of Plant Industry as vice presidents, Dr. F. B. Smith of Iowa as secretary-treasurer, and J. D. Luckett of New York as editor.

The annual Chilean Nitrate Research Award was divided between Drs. W. H. Pierre of West Virginia and H. Jenny of Missouri. M. A. McCall, F. D. Gardner of Pennsylvania, Dr. W. H. Stevenson of Iowa, C. F. Shaw of California, and W. W. Burr were elected fellows of the society.

**World's Grain Exhibition and Conference.**—A recent announcement of this gathering, to be held in Regina, Saskatchewan, states that it will probably be held from July 24 to August 5, 1933. The exhibition will be arranged for competitive purposes in 56 classes of exhibits, with a prize list of over $200,000. The classification includes wheat—hard red spring, hard red winter, soft red winter, white winter, and durum; oats—white, yellow, and early; barley—six rowed (Manchurian type), six rowed (Trebi type), two rowed (Chevalier type), two rowed (Duckbill or Thorpe type), and hull-less; corn—dent and flint; rye; buckwheat—black, silver hulled, and rough or rye; rice—unhulled; millet—foxtail and other types; field peas—large, small, and canners; field beans—white and other types; soybeans—yellow and other colors; flax—seed other than for fiber and seed for fiber; hemp—any variety; alfalfa or lucerne—any variety; clover—red, alsike, sweet, and white dutch; grasses; sunflowers; field roots; and garden vegetable seeds.

The conference will include papers of both practical and scientific interest, classified as follows: (a) Agronomy, which will include soils—physics, chemistry, and bacteriology; cultural problems and methods; fertilizers, weeds; plant breeding and genetics; diseases of plants; experimental methods (plat work); seed production and registration; and irrigation; (b) insect pests and friends; (c) economics, including marketing, which will include farm management and costs, grading, merchandising and financing, storage and transportation, and world markets; (d) milling and baking; (e) agricultural machinery, which will include seed cleaning, cultural, and harvesting; and (f) general. If thought advisable a series of purely scientific conferences may also be arranged.

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# EDITORIAL

## RESEARCH AT THE 1931 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

From the point of view of research in agriculture and home economics, the 1931 convention of the Association of Land-Grant Colleges and Universities was much more than a routine gathering. Casual examination of the program, to be sure, revealed few papers dealing primarily with research in the general sessions, and little business pertaining to it required the attention of the executive body. None the less, its influence was widespread and unmistakable. The entire convention atmosphere was permeated with acknowledgments of the fundamental contributions of research to the development of the land-grant institutions in the past, and there was a tacit acceptance of the principle that its adequate support was essential in any well-rounded program for the future.

Consideration of distinctive research problems was concentrated in the appropriate sections and especially in the subsection of experiment station work. The joint sessions of the three subsections of agriculture, however, contained papers on Graduate Work and the Experiment Station, by President R. M. Hughes of Iowa, in which a considerable use of fellowships in station work was advocated, and on Interrelations of Teaching, Extension, and Research, by Dean W. C. Coffey of Minnesota, who cautioned against any slowing down of research by excessive demands of graduate students upon the time and energies of research workers. In addition, the section of home economics as usual listed research as the subject of its final session, as noted later.

The program of the subsection of experiment station work was opened with a paper on Commercial Support for Agricultural Research, contributed by Dr. H. L. Russell, director of the Wisconsin Alumni Research Foundation and for many years director of the Wisconsin Experiment Station. Dr. Russell recognized that special difficulties and perplexities attend the acceptance of assistance from commercial sources, but he raised the question whether,. provided the public interests are at all times kept uppermost in mind, it is not sound policy for a station which can utilize private resources in the interest of the public to make use of such facilities. Numerous potential opportunities to do this were cited, as in the domains of rural electrification and the heating and insulation of dwellings. Even in such cases, however, certain precautions were suggested as follows:

"Not only must the station be master of the situation as to the formulation of plans for the work to be undertaken, but the results obtained must also be available for the station to use as it may deem best, keeping the public interest constantly in mind. Preferably, monies for research in any particular line should be given to the college (or the station), and not to an individual staff member. Not only should the receipt of all such funds flow through the regular fiscal channels of the institution, but this should be particularly true with reference to all expenditures incurred."

In a stimulating discussion of basic questions entitled The Influence of Agricultural Research on Our Social and Economic Order, Director C. B. Hutchison of California divided agricultural research into two classes, (1) natural science research, which "in its application has to do with improving and increasing production by reducing the amount of time or effort necessary to produce a unit of product and making more resources available, and (2) social science research, which relates to the balancing of production and consumption, the ways and means of making adjustments to changes and to the distribution of the benefit from scientific progress among the members of society." The effects of the natural science type of research on the social and economic order depend largely, he believed, on the length of time required to influence production. If slow, there are few problems, and adjustments are made even without guidance or planning. Research tending primarily to substitute scientific knowledge for guesswork or speculation he considered to have little immediate disturbing effect, and the same is usually true of studies on the utilization of waste products and of plant and disease control.

For those changes which are either sudden or revolutionary, careful planning is deemed necessary, but "it is not the function or duty of agricultural colleges to act as planning agencies. Separate but coordinate planning agencies should be established for each State and each agricultural region. The colleges of agriculture should cooperate with these agencies by helping to educate farmers and students in the fundamental principles relating to social and economic problems, by training research workers, and by conducting a large share of the necessary research in social sciences relating to agriculture to develop the required facts and information upon which such plans must be based."

However, this does not mean, he made clear, "that we will or should cease to conduct research in the natural sciences. Such studies must be continued. We shall never have a stabilized agriculture so long as we depend upon frosts and pests, floods and droughts to control agricultural surpluses. We need more, not less, research of the natural science type. But we also need a great deal more of social science research. We need to understand better the intricate and complex phenomena of plant and animal biology, but we also need to know better how these phenomena may be adapted and directed to social use. With this knowledge we shall be able to promote a better balance between production and consumption and consequently a better distribution between the members of society of the gains and benefits derived from scientific progress."

One of the major themes of the convention was the land-grant college survey of 1930. The task of evaluating the results of this survey in its relation to the experiment station director was assigned to Director R. Y. Winters of North Carolina, who presented conclusions derived from correspondence with directors and others. His inquiry developed the fact that of 36 directors reporting 31 had already made use of the survey information, and that in a number of cases portions of it had been used as subjects for discussion in one or more staff meetings.

As regards the specific phases discussed, "replies from Federal and State administration of research bear witness to the mutual good that has come from the study of cooperative relations between Federal and State research. It has resulted in a better understanding among the stations and a tendency toward more intimate and effective cooperation. The report of progress in cooperative effort and the recognition of advantages in cooperation have been followed by increasing State cooperation in regional problems and a more determined effort by Federal agencies to avoid local problems. This, in turn, has brought about more frequent intercourse for mutual advice upon all phases of research."

Another chapter which was reported as especially helpful was that dealing with station organization and management. "Eight institutions have used these results as a basis for specific changes in cooperative relations between major groups of the station, regulation of outside employment, adjustment of salary scale between 9 and 11 months' workers, budget making, rank of research workers in relation to academic workers, and have found suggestive information for comparisons or ranges of compensation and training of staff members with those of the local station."

In conclusion Director Winters pointed out that "the results of research are now receiving the most severe test since the establishment of the experiment station system. . . . The survey and report have, therefore, come at an opportune time not only for the valuable information it contains but for the stimulation of thought and action toward more efficient research organization and procedure."

The twilight zone between research and extension, a topic of perennial interest, again received consideration in a paper by Director C. A. McCue of Delaware entitled When Shall the Results of Research Be Turned over to the Extension Service for Use. This paper, though of sufficiently broad interest to justify inclusion in a joint program, was presented and discussed before the subsection of experiment station work and later repeated before the extension subsection. Based on replies received from 40 station and 30 extension directors, it revealed a steadily growing accord between these groups as a result of a more complete understanding of their respective viewpoints and public obligations. It was generally agreed that conditions so vary that set rules can hardly be expected, but that results should ordinarily be released as promptly as may safely and fairly be done. For strictly scientific work, this will normally mean delay until the stage of formal publication, but with some types of experimentation release may be made much earlier. Often the combined judgment of the investigator and extension worker is desirable.

Because of the immediate interest of the experiment stations in *Experiment Station Record*, a discussion of the policies of this periodical was presented by its editor. Attention was directed in this discussion to the fact that there has been no enlargement of space for the publication of abstracts since 1911, although during this period the annual revenues of the State experiment stations have risen from $3,662,425 to over $18,000,000 and the funds of the Federal Department of Agriculture available for research by about the same amount, as well as a remarkable development of other agencies carrying on research in agricultural science and related fields. As a result "there is now to be abstracted probably several times the potential grist of 20 years ago."

Various expedients to provide more space were suggested for consideration, as it was made clear that "unless the existing facilities and resources are materially enlarged, space and cost limitations will soon make necessary more or less modification in the policies which have thus far been adhered to." Perhaps, it was suggested, "certain changes should be made in any event. In that case, whether these changes will involve the omission of the editorials, a closer spacing of the type, reduction in the free mailing list, shorter abstracts, a more restricted field of review, or some other means not yet apparent must depend to no small degree upon the needs and desires of the users of the *Record* as we understand them."

Considerable discussion followed the presentation of this paper, and a resolution was adopted by the subsection expressing the view that additional facilities should be provided. This action was later indorsed by the executive body.

The report of the committee on experiment station organization and policy dealt with two questions, the use of Federal funds for investigations in forestry and the formulation of research projects. On the first of these two matters, a questionnaire sent out by the committee revealed a preponderance of sentiment in favor of a liberalizing of prevailing policies as regards forestry studies. The committee submitted as its opinion that there are many problems of agriculture associated with phases of forestry the solution of which is as important as some in other lines on which no question as to approval arises. In some States such problems may deal with farm woodlands, in others with a sound basis for a State land policy. In the economic adjustments which seem destined to take place in agriculture, the forest can not be ignored either as a direct source of income to the farmer or as a part of a program for the more efficient use of land. Accordingly the committee recommended that "projects in forestry, as defined above, when proposed by directors to be supported by Hatch, Adams, or Purnell funds, should be given the same consideration that is now given to projects in any of the well-established lines of agricultural research." Problems in commercial forestry, it was suggested, "for the present . . . might well be left to other agencies or to the station's State funds."

As regards the formulation of research projects, the committee repeated its recommendations of 1927, and added six suggestions as to the minimum of essentials for an acceptable project outline. These points cover the following details: A clear-cut specific title, accurately characterizing the work to be undertaken; the leaders and cooperators in the project; clearly defined objectives; an explicit statement of procedure to be followed; evidence of familiarity with work of others on the subject; and allotment of funds. Recognizing that the project outline "is not a thing to be standardized . . . , it is believed that the handling of projects by the Office of Experiment Stations, as well as by station directors, would be simplified and expedited if these requirements and suggestions are consistently adhered to in formulating the project outline."

The report of the joint committee on projects and correlation of research, for which Provost A. R. Mann was serving as acting chairman in the absence of Director F. B. Mumford of Missouri, showed that there was cooperation between all the stations and the U. S. Department of Agriculture, the total number of cooperative agreements being nearly 1,000. This represented a decrease of about

200 from the previous year, but, as the committee pointed out, "evidences of progress made during the year are to be found, not in numbers of agreements made and entered into, but in the refinements of projects, rounding out of programs, and focusing them upon vital problems of economic and social importance. The decline noted in the number of cooperative agreements can, therefore, be attributed not to a waning of interest in collective effort but rather to improved relations and to revision in programs, through which many projects have been consolidated into larger undertakings of broader significance." As an outstanding example of such advancement, specific mention was made of the formulation of an extensive research program designed for a three-year study of interrelated farm and home economic, educational, and rural life problems of the Southern Appalachian Highlands, in which several divisions of the five experiment stations of the area, the U. S. D. A. Bureaus of Agricultural Economics and Home Economics and the Forest Service, the Office of Education of the Department of the Interior, and a number of independent educational and religious organizations are participating.

In response to instructions by the experiment station subsection in 1930, the joint committee considered the status of the six special research committees of the association appointed in 1925 following the passage of the Purnell Act. A recommendation that these committees " be discontinued with the thanks of the association for highly valuable services rendered, and that in the future, except as emergencies may arise, cooperative projects and programs be arranged for through the usual channels " was subsequently ratified by the executive body.

The usual report of relations with the *Journal of Agricultural Research* was made by Director S. W. Fletcher of Pennsylvania for the joint committee on publication of research. The number of manuscripts received during the year ended October 31, 1931, included 88 from the experiment stations, 87 from the U. S. Department of Agriculture, and 1 from cooperating institutions. The total number handled was 203 as compared with 205 in 1930.

A special committee on Federal-State relations in agricultural research, consisting of Director Fletcher, chairman, with Directors M. J. Funchess of Alabama and E. C. Johnson of Washington, presented a comprehensive report, discussing very frankly data and opinions obtained from directors and staff members who are joint leaders of cooperative projects. From the standpoint of these groups, the committee took up such matters as the notification and consultation of directors upon the initiation of Department research within a State; the desirability of more uniform memoranda of agreement in cooperative work; the professional relations of workers; the origin of cooperative projects; the operation of Federal field stations, maintained independently in the States and deemed by the committee "one of the most embarrassing features of Federal-State relations in agricultural research"; the function of the Federal Department in research, both fundamental and specialized; the overorganization of research, against which the committee noted "a distinct reaction in the State experiment stations;" national programs in research and their integration; and the possibility of an ultimately "more or less complete nationalization of agricultural research, with Federal bureau administration throughout the United States." A number of specific suggestions as to some of these matters were put forward as a basis for conference with Department representatives with a view to their readjustment. It was emphasized, however, as the fundamental finding of the committee that "in general mutually cordial and helpful relations exist between the Federal and State agencies, and there is constant improvement in the administration of the details of cooperative research."

The report of a special committee on experiment station exhibits at the Century of Progress Exhibition to be held at Chicago in 1933 indicated as the unanimous opinion of the committee that the stations and the U. S. Department of Agriculture should cooperate in bringing about a joint, unified and coordinated exhibit designed to show specifically what science has done for agriculture. As one feature of the exhibit, it is expected that the Office of Experiment Stations will include in its exhibit historical and statistical material concerning the stations as a whole. The formulation of more definite plans is to proceed as rapidly as possible, but in most matters must await the decision by Congress as to the extent of Federal participation.

Still another matter to receive consideration was the distribution of experiment station publications in foreign countries. Inquiries reported by Vice Director A. Boss of Minnesota indicated that many important libraries and institutions abroad are now being inadequately supplied, and the possibility of formulating address lists or of attempting distribution through a central agency was discussed by several speakers. A special committee, consisting of Mr. James T. Jardine, chief of the Office of Experiment Stations, Director B. E. Gilbert of Rhode Island, and Director S. B. Doten of Nevada, was appointed to investigate this important subject and report at the next convention.

In the section of home economics the work of the U. S. D. A. Bureau of Home Economics was reviewed by its chief, Dr. Louise Stanley, and Miss Sybil L. Smith of the Office of Experiment Stations reported that there are now 42 States receiving support for home economics research from the Purnell funds, with a total allotment of over $289,000. In Hawaii the Adams and Hatch funds are also being so utilized, while in many States projects are being financed jointly by Federal and State funds or by State support alone. This indicates that the interest in such research is much broader than is sometimes realized, and that the opportunities for carrying it on are by no means restricted to Purnell allotments.

The organization of home economics research was also considered in a stimulating and constructive paper by Dr. Agnes Fay Morgan of California entitled A Forward-Looking Program of Research in Home Economics in Land-Grant Colleges. Dr. Morgan made a strong plea for concentration upon quality rather than quantity in such research, asserting that about one-fourth of the current projects are of fundamental character, while nearly one-half of the remainder are of the descriptive or survey type, which as regards social problems "may be fruitful if enough wisdom and critical judgment be expended in the analysis of the data as well as in the plan for collection." In conclusion she maintained that "the long-time program of any one college need not be widespread, nor should it attempt to cover every one of the 17 to 20 subdivisions of the home economics fields enumerated in most outlines of the subject. It need not cover even all 5 of the main subject matter divisions of the American Home Economics Association. A mutually acceptable assignment of certain subjects among the colleges is greatly to be desired." She suggested as a possible aid in fostering such concerted action a standing committee of the section, "made up of all the administrative or responsible research directors of the land-grant colleges."

Taken collectively, the research papers and reports at the convention set a high standard, and their influence can not fail to be helpful both to those who heard and to those who will later read. To an unusual degree they were also effectively supplemented in most cases by the ensuing discussions. This was especially true in the subsection of experiment station work, where a restricted program afforded ample time for full consideration of the various matters presented and the general attitude was noticeably one of encouragement of such discussion. An exact balance on such occasions is not easy to obtain, nor are opportunities always made the most of when available, but experience increasingly indicates that a truly informative and representative exchange of views is a goal well worthy of attainment. In this respect the 1931 sessions were very successful.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**Zwitterions, I, II** (*Biochem. Jour., 24 (1930), No. 4, pp. 1080–1097, figs. 18*).—The two papers here noted form a contribution from the Biochemical and Nutritional (Medical Research Council) Laboratories, Cambridge.

I. *Proof of the zwitterion constitution of the amino-acid molecule,* L. J. Harris.—The HCl and NaOH titration curves of glycine (measured by pH indicator virages) were determined in the presence of increasing concentrations of formaldehyde. The weakening of the basicity of the $NH_2$ group by the formation of a methylene derivative was found to result in a displacement not of the HCl curve (the apparent basic curve) but of the NaOH curve (the apparent acid curve).

"It follows that the HCl and NaOH titration curves of the amino acid represent, not neutralization of $NH_2$ and COOH, respectively, as in the classical view, but 'replacement' (back titration) of COOH and of $NH_3$ by a stronger acid and a stronger base, HCl and NaOH, respectively. Direct evidence is therefore available of the accuracy of the zwitterion (ionized internal salt) theory. That the shift with HCHO to lowered basicity is characteristic of a basic curve is shown by similar investigations with free bases and ammonium salts, etc., and with other amino acids and ampholytes."

II. *Amino-acids, polypeptides, etc., and proteins as zwitterions, with instances of non-zwitterion ampholytes,* T. W. Birch and L. J. Harris.—In the case of ampholytes containing more than one $NH_2$ or COOH group the number of curves characteristically shifted was indicated as equal to the number of basic groups, and that of those virtually unaffected to that of the COOH groups.

The method was used for determining whether a given ampholyte possesses the zwitterion or nonzwitterion constitution. By its aid it was also shown to be possible to determine which are the basic and which the acid components of the titration curves.

"New formulas must be ascribed to the monohydrochlorides and the free amino acids in the case of diaminomonocarboxylic acids, and to the monosodium salts and the free amino acids in the case of dicarboxymonoamino acids. The stages in the ionization of cysteine, tyrosine, and other amino acids and their salts are similarly set out. The apparent acid constant of taurine is demonstrated to relate to the basic group. *p*-Aminophenol and *p*-aminobenzoic acid are demonstrated to exist as nonzwitterions, HCHO giving a significant shift of the HCl and not the NaOH curve. Polypeptides are shown to be zwitterions. Similarly with a protein (gelatin) the COOH groups titrate in the acid and the $NH_3$ groups in the alkaline pH range.

"COOH and $NH_2$ groups in titration curves may be identified also (and hence the zwitterion theory tested) by a new 'temperature coefficient' method, which depends on the fact that the dissociation constants of $NH_2$ groups are found to show only small temperature changes when expressed on the pOH scale and large changes on the pH scale, and vice versa for COOH groups."

**The rate of liberation of arginine in tryptic digestion,** J. A. Duaphinee and A. Hunter (*Biochem. Jour., 24 (1930), No. 4, pp. 1128–1147, figs. 3*).—A study of the rate at which arginine (or an arginine complex susceptible to the action of arginase) is liberated during the tryptic digestion of caseinogen, gelatin, edestin, fibrin, egg albumin, and Witte peptone is here reported in a contribution from the University of Toronto.

"In the case of the first two the initial rate of liberation is so great that half of their total potential arginine may easily be set free within three hours. The speed with which Witte peptone yields its arginine is but slightly inferior. With the other proteins the appearance of free arginine is a much more gradual process. Egg albumin exhibits a quite peculiar behavior in that the liberation of arginine (like that of free amino groups in general) commences only after a latent period of one or two days. In no case did trypsin liberate from a protein the total amount of arginine obtainable on complete hydrolysis. The yield with fibrin was only two-thirds of the possible maximum, with each of the others four-fifths. These fractions appear to be characteristic. In the acid hydrolysis of gelatine arginine is liberated less explosively and at a more regular rate than in its tryptic digestion."

The possible bearing of these findings upon certain problems of protein structure is discussed.

**Synthesis of the *i*-hydroxyasparagines,** A. C. Chibnall. **A note on their dissociation constants,** R. K. Cannan (*Biochem. Jour., 24 (1930), No. 4, pp. 945–953*).—This synthesis involves the stages maleic acid, chloro- and bromomalic acids, the mixed inactive hydroxyaspartic acids, the separation of the last-named compounds by fractional crystallization, and the preparation from the separated components of the mixture of inactive para-hydroxyaspartic acid diethyl ester, inactive para-hydroxyaspartic acid diamide, inactive α-para-hydroxyasparagine, inactive β-para-hydroxyasparagine, inactive anti-hydroxyaspartic acid diethyl ester, inactive anti-hydroxyaspartic acid diamide, inactive α-anti-hydroxyasparagine, and inactive β-anti-hydroxyasparagine.

Of the method used in obtaining the dissociation constants given it is stated that "complete hydrogen electrode titrations of aspartic acid, hydroxyaspartic acid, *i*-β-asparagine, *i*-β-*para*-hydroxyasparagine, and *i*-α-*anti*-hydroxyasparagine have been carried out. From the data the 'titration constants' of each substance have been calculated. These values must be close approximations to the dissociation constants uncorrected for activity ($p_{K'}$).

**The composition of the fatty acids present as glycerides in the liver oil of the thresher shark (Alopoecia vulpes),** J. A. Lovern (*Biochem. Jour., 24 (1930), No. 4, pp. 866–869*).—A sample amounting to 650 gm. of the oil was prepared by steaming from the liver (4 kg.) of a single specimen of *A. vulpes*, the oil being of a golden brown color and showing some separation of crystalline matter on standing. The percentage of free fatty acids, calculated as oleic acid, was 0.2, unsaponifiable 1.83; the saponification value was 181, the iodine value 176, the refractive index at 20° C., 1.4741. The iodine value of the unsaponifiable matter was 102, and this part of the oil contained 21.8 per cent of cholesterol.

By the lead salt separation method and that of the fractionation of the methyl esters there were found of myristic acid 7.4 per cent, of palmitic 11.3 per cent, of stearic 0.2 per cent, and of unsaturated acids containing 14, 16, 18, 20, and 22 carbon atoms, respectively, 1.6, 12.0, 19.1, 30.9, and 17.3. From the iodine value and cholesterol content of the unsaponifiable fraction it is concluded that the squalene content of the oil, if any, must be very small.

**Studies on hemicelluloses, I, II** (*Biochem. Jour.*, *24* (*1930*), *Nos. 1, pp. 59–66; 4, pp. 973–979*).—The first of the two papers here noted presents a brief review of previous work, outlines the general methods to be used in the present series of investigations, and describes the application of the general method to the separation of four hemicellulose fractions from wheat bran; while the second report records the results of a similar experimental treatment of maize cobs.

I. *The hemicelluloses of wheat bran*, F. W. Norris and I. A. Preece.—In outline, the procedure consists in (1) extracting pectin with ammonium oxalate solution at 90° C. and a 0.5 per cent concentration of the extractant salt, after which (2) "removal of lignin is carried out by two extractions with 3 liters of 50 per cent alcohol containing 1 per cent of NaOH, each extraction being carried out under reflux for 2 hours. After the second extraction, the filtered tissue is further treated under reflux with 3 liters of neutral alcohol (50 per cent) for 1 hour. After filtration through muslin, excess liquid is again removed at the press." This is followed (3) by several successive extractions with 4 per cent aqueous sodium hydroxide, and treatment of the filtered combined extracts with "rather more glacial acetic acid than is necessary to neutralize" the alkali content. The precipitate, designated hemicellulose A, was thus obtained. This required to be separated by centrifugation. From the supernatant liquor and first washings separated from the hemicellulose A, after filtering through paper pulp, the addition of one-half its volume of acetone precipitated a second fraction, hemicellulose B, which was purified, in part, by repeated re-solution and reprecipitation. The filtrate from the second yielded, by treatment with an equal volume of acetone, a third fraction, or hemicellulose C, which was purified by redissolving in water and reprecipitating with acetone and repeating this cycle several times. A typical operation is described as yielding, from 400 gm. of bran, 8 gm. of hemicellulose A, 4.5 gm. of B, and 4.5 gm. of C.

The first two preparations, redissolved in 4 per cent sodium hydroxide, could be precipitated as copper complexes by treatment with Fehling's solution, the hemicellulose being recovered by treatment of the precipitate with hydrochloric acid and precipitating the free hemicellulose with the assistance of acetone. From hemicellulose B two fractions, the one precipitated at once upon adding the Fehling reagent, the other precipitated only after the addition of acetone to the filtrate from the first, were obtained by means of the copper complex formation. Hemicellulose C yielded only a copper complex requiring acetone for its precipitation. Hemicellulose preparations designated B1, B2, and C2 were thus secured.

These four fractions were found "chemically and physically distinct, two of them containing small percentages of uronic acid," and from preliminary hydrolyses "hemicellulose B2 appears to be a glucosan, whilst the other fractions are largely composed of pentose residues."

II. *The hemicelluloses of maize cobs*, I. A. Preece.—Using methods and a terminology the same as those above recorded, the author obtained from maize cobs the four hemicellulose fractions A, B1, C1, and C2, "none of which corresponds to a pure xylan.

"Hemicellulose A yields on hydrolysis xylose and a uronic acid; B1 and C1 yield varying proportions of xylose, uronic acid, and methylpentose; C2 gives arabinose, uronic acid, and methylpentose. In all cases the proportion of pentose residues present far exceeds the combined proportions of residues of methylpentose and uronic acid."

**Selective fermentation.—I, Alcoholic fermentation of glucose, fructose, and mannose mixtures**, H. SOBOTKA and M. REINER (*Biochem. Jour., 24 (1930), No. 4, pp. 926–931*).—The factor $K_{G/F}$ was determined for several types of yeast. All types were found to prefer glucose to fructose at a rate of 2:1 or higher; but this factor was found subject to changes dependent on the culture medium used. No correlation was found between selective fermentation and saccharase or maltase content. The selective fermentation of mixtures of mannose plus glucose and mannose plus fructose was also studied.

**Oxidation-reduction studies in relation to bacterial growth, I, II**, B. C. J. G. KNIGHT (*Biochem. Jour., 24 (1930), No. 4, pp. 1066–1074, figs. 2; 1075–1079, figs. 2*).—These two papers present first a study of general behavior, second the experimental basis and working details of a method of controlling the oxidation-reduction potentials.

1. *The oxidation-reduction potential of sterile meat broth.*—With the object "to establish some fundamental requirements of technic preliminary to the application of the ideas of oxidation-reduction potential theory to bacterial systems," the author studied the behavior of completely de-aerated, sterile, buffered meat broth with reference to the comparative results obtained from electrode potential measurements and effects upon oxidation-reduction indicators over the pH range 4.0 to 10.5.

"It is found that the two methods do not indicate the same potential level, a dye indicating a more negative potential than would be shown by an electrode in broth alone. Quantitative data are provided that should assist the characterization of the electromotively active system of broth."

II. *A method of poising the oxidation-reduction potential of bacteriological culture media.*—In brief, "the negative potential drift is balanced by passing into the medium a controlled stream of very dilute oxygen in nitrogen. The concentration and rate of flow of the gas mixture are adjusted until there is equilibrium between the rate of reduction of the broth system and its rate of oxidation by the oxygen; the potential then remains constant. The advantage of using oxygen lies in its comparative inertness as an oxidizing agent, the ease and smoothness with which the rate of addition can be controlled, and the fact that no solvent, etc., accumulates in the medium under examination."

In putting this method into practice, advantage was taken of the presence of about 0.5 per cent of oxygen in commercial cylinder nitrogen. Through two flow meters cylinder nitrogen was passed into the medium in two streams, of which one passed through a tube containing heated copper gauze and was completely deprived of oxygen, while the other, by-passed through a second flow meter, carried its oxygen content into the solution to be poised. A very effective stabilization by this means of a sterile broth of pH 7.6 at $E_h$ 0.00 volt is shown by the time-potential curve.

**The action of pepsin on gelatin**, R. K. CANNAN and E. MUNTWYLER (*Biochem. Jour., 24 (1930), No. 4, pp. 1012–1020, figs. 2*).—Changes in the acid- and base-binding power accompanying the digestion of gelatin by pepsin were determined with the help of hydrogen electrode titration curves, indicating, as the main chemical effects of peptic activity, the hydrolysis of peptide linkages to set free $\alpha$-amino and carboxyl groups. Some observations are added correlating the chemical changes with certain changes in the physical behavior of the protein.

**The inactivation of pancreatic lipase by heat**, I. H. McGILLIVRAY (*Biochem. Jour., 24 (1930), No. 4, pp. 891–904, figs. 3*).—A lipase preparation was specially purified by a method of which the detail is described. The inactivation of this lipase by heat was found to be unimolecular, the reaction of greatest stability proving to be about pH 6.0. "The critical increment for the heat-inactivation process in 50 per cent glycerol has been determined at three pH values, 6.0, 8.01, and 5.0. It was found that the critical increment was sensibly the same at all three points, and was of the order of 46,000 calories." Similar data for lipase solutions in 25 and in 80 per cent glycerol are given.

**The molecular weight of vitamin A,** H. R Bruins, J Overhoff, and L K. Wolff (*Biochem. Jour., 25 (1931), No. 2, pp. 430–438*).—The authors have compared the relative molecular size of carotene and a vitamin A concentrate obtained from the unsaponifiable fraction of sheep liver extract by determining their diffusion constants in the same liquid, xylene.

The diffusion constant of vitamn A was found to be higher than that of carotene, the difference between the two exceeding considerably the probable errors of measurement. "The ratio of the molecular weights of the two substances has been calculated, and from this a molecular weight of about 330 has been deduced for vitamin A. The value obtained causes the assumption of a simple chemical relation between vitamin A and carotene to appear improbable."

**A note on the reprecipitation of the antiscorbutic factor from decitrated lemon juice,** S. S. Zilva (*Biochem. Jour., 25 (1931), No. 2, pp. 594, 595*).—Attention is called to the observation, noted in a previous paper (E S. R., 65, p. 503), that in the concentration of vitamin C from decitrated lemon juice when the active precipitate with lead acetate at pH 7.2 was dissolved in acetic acid and the reaction brought up to pH 7 no precipitate formed, and that the fraction precipitated at pH 8 to 9 was entirely inactive, although Grettie and King (E. S. R., 62, p. 501) and Sipple and King (E. S. R., 62, p. 804) obtained a second active precipitate at pH 7.2 to 7.4.

It has now been found that if less acetic acid is used the pH at which the second precipitate begins to appear is lowered (pH 5.5 to 6), and that a considerable precipitate is obtained when the pH is raised to 7.4. This precipitate contains some activity, as a dosage equivalent to 5 cc. of the original decitrated juice gave nearly the same degree of protection as an equivalent of 1.5 cc. of the first precipitate. It is thought inadvisable, however, to carry on the second precipitation in view of the marked loss in reducing capacity occurring at this stage.

**A new method for the separation of the products of protein hydrolysis,** M. A. B. Brazier (*Biochem. Jour., 24 (1930), No. 4, pp. 1188–1198*).—A considerable improvement in the determination of the amino acids contained in the hydrolysis products of proteins was found by the author of this contribution from the Imperial College of Science and Technology, London, to be made possible by boiling the amino-free hydrolysis product with excess of copper carbonate until all the amino acids present were converted into their copper salts, and evaporating to dryness in the presence of excess copper carbonate, after which the copper salts insoluble in water were separated from those soluble in water and the last-named fraction further separated into copper salts soluble in methyl alcohol and those insoluble in methyl alcohol. From the copper salts soluble in methyl alcohol were separated the two groups of free amino acids respectively soluble and insoluble in absolute alcohol. An important feature of the procedure is stated to be the drying of the mixed copper salts by treatment with absolute acetone.

The water-insoluble fraction of the copper salts was found to contain leucine, phenylalanine, and aspartic acid; the fraction soluble in water but insoluble in methyl alcohol yielded alanine, tyrosine, glutamic acid, histidine, and arginine, also glycine and the remaining bases when present; the copper salts soluble both in water and methyl alcohol, valine, hydroxyvaline, proline, and prolylphenylalanine. As an example of the copper salt procedure, the hydrolysis of zein and the isolation of the resulting amino acids is given in experimental detail.

In the case of zein, 87.89 per cent of the total nitrogen was obtained in the form of actually isolated amino acids. Of the remainder it is noted that "5.6 per cent more of the nitrogen was found in precipitates, 93.5 per cent in all being traced."

**An improved design of the Van Slyke apparatus for the estimation of amino-nitrogen,** S. J. Folley (*Biochem. Jour.*, *24* (*1930*), *No. 4*, *pp. 961–964*, *figs. 2*).—The desirability of eliminating rubber connections from the customary form of the Van Slyke amino nitrogen apparatus (E. S. R., 26, p. 22) is pointed out, since the "shaking of the deaminizing chamber and Hempel pipette subjects the rubber to periodic stretchings which must diminish its impermeability to gases. . . . If thick-walled rubber tubing is used in order to lessen the danger of loss of gas at the joints, shaking subjects the thick-walled glass capillary tubing to strain on account of the elasticity of the rubber."

To eliminate these difficulties, "the gas system is made in one piece and mounted without strains on a stout, upright board, having apertures cut in it where necessary." This supporting board is hinged to a base which, in turn, is firmly screwed to the table. Shaking is effected by swinging the board upon its hinges through the agency of a driving arm and crank disk operated by a rheostat-controlled motor. "With this apparatus it was found possible to estimate amino nitrogen to 0.01 mg." Data illustrative of such results are given, together with diagrams of the modified apparatus and its mounting.

**A sensitive reaction for cysteine,** R. Fleming (*Biochem. Jour.*, *24* (*1930*), *No. 4*, *pp. 965*, *966*).—Cysteine hydrochloride was found to react readily with dimethylparaphenylenediamine on heating in the presence of a small quantity of ferric chloride, giving a deep blue color, stable and similar to that of methylene blue, though not exactly matching the shade of the dye named.

"The most suitable proportions in which the reagents should be mixed are as follows: To 0.5 cc. of the *p*-phenylenediamine reagent should be added 1 cc. of the cysteine solution followed by one drop of the $FeCl_3$ solution. On heating the mixture almost to boiling point and allowing it to stand, the deep blue color is produced. The mixture of cysteine and *p*-phenylenediamine reagent may first be heated together and the drop of $FeCl_3$ then added to the hot solution, when the blue color develops as before. The test is sensitive with 0.05 mg. of cysteine hydrochloride."

**The colorimetric determination of cystine by means of the uric acid reagent,** C. Rimington (*Biochem. Jour.*, *24* (*1930*), *No. 4*, *pp. 1114–1118*).—"To 2 cc. of cystine solution, or volume equivalent to about 1 or 1.5 mg. cystine, add 1 cc. of 20 per cent sodium sulfite . . . and wait 1 minute. Add 8 cc. of 3 N sodium carbonate . . . solution, 5 cc. of 40 per cent urea solution, mix and run in 4 cc. of Folin and Marenzi's uric acid reagent. After 5 minutes make up to 25 cc. (or 50 cc. if preferred) with 3 per cent sodium sulfite . . . solution and proceed with the colorimetric comparison."

**Factors for converting percentages of nitrogen in foods and feeds into percentages of proteins,** D. B. Jones (*U. S. Dept. Agr. Circ. 183* (*1931*), *pp. 22*).—Attention is directed to the wide range of error which may be introduced into the estimation of the protein content of foods and feeds by the use of the arbitrary factor N×6.25. On the basis of knowledge now available on the chief proteins in most of the common food materials and the percentage of nitrogen in these proteins, special conversion factors are suggested as follows: Wheat endosperm 5.7; wheat embryo 5.8; wheat bran 6.31; wheat (whole kernel), rye, barley, oats 5.83; rice 5.95; hempseed, cottonseed, sunflower seed, flaxseed, squash seed, pumpkin seed, sesame seed, cantaloupe seed, coconut, hazelnut, walnut, butternut, castor-bean 5.3; almonds 5.18; Brazil nut, peanut 5.46; soybean 5.71; milk 6.38; and gelatin 5.55. For corn, eggs, meats, navy bean, Lima bean, mung bean, velvetbean, adzuki bean, and jack bean, the factor 6.25 is retained.

"Although it is not claimed that these special factors will give absolutely correct values, it is believed that they will give the true protein content more accurately than will the indiscriminate use of the conventional factor 6.25."

A bibliography of 105 titles is appended.

**Home-made sauerkraut,** C. S. Pederson (*New York State Sta. Circ. 123 (1931), pp. 4, fig. 1*).—Popularizing results of his published researches on sauerkraut fermentations and organisms (E. S. R., 64, pp. 414, 415) the author presents working directions for the home preparation of sauerkraut and the cold-pack canning of the product.

**The enzymic clarification of fruit juices,** Z. I. Kertesz (*New York State Sta. Circ. 124 (1931), pp. 4, fig. 1*).—This circular presents a popular account of the method devised at the station (E. S. R., 64, p. 713; 65, p. 712). "On the basis of the work done at this station, an enzyme preparation has been developed commercially. This is a clear, practically tasteless liquid, and is standardized for clarifying action by the manufacturer."

## METEOROLOGY

**The climates of North America according to a new classification,** C. W. Thornthwaite (*Geogr. Rev., 21 (1931), No. 4, pp. 633–655, pl. 1, figs. 13*).—A classification based on temperature and rainfall periodicity and efficiency is elaborated, and 32 climatic provinces, 8 of which are considered of major importance, are mapped according to this classification. The climatic bases of soil and plant distribution are briefly discussed.

"Geographers, ecologists, and soil scientists for the most part have been working independently, each in ignorance of the discoveries made by the other group. Yet it is evident that the distributions of the soils and vegetational elements of the natural landscape are causally interrelated, as well as causally related to climate. It is hoped that soil science and ecology may find in this classification a common ground which may bring them together and which can be used in the explanation of climax formations and mature soils. It is not suggested that the climatic classification here presented is in its final form or is satisfactory in every detail. It is believed, however, that the climatic elements of the landscape are here analyzed with a greater precision than has heretofore been attained. Köppen's scheme brings out the general relations of vegetation and soil to climate over the earth, but fails in detailed local analyses; the present classification in so far as it has been tested has been found to work as well in detailed as in general analyses."

**Climate of Alabama,** P. H. Smyth (In *Agriculture of Alabama. Montgomery: Ala. Dept. Agr. and Indus., 1930, pp. 65–78, figs. 7*).—Climatic conditions of the State, with special reference to temperature, precipitation, and frost, are shown in text and charts.

It is stated that "the average temperature for the State as a whole is 63.7°; of the northern portion, 61°; of the middle portion, 64°; of the southern portion, 66°." The highest temperature recorded is 112° F.; the lowest, −18°. The dates of the last killing frost in the spring vary "from about February 15 along the immediate shores of Mobile Bay and the Gulf of Mexico to a little later than April 10 in the extreme northern border region and on some of the more elevated areas." The dates of first killing frost in autumn vary "from about October 25 in the extreme northern portion to about December 10 in the immediate coastal sections." The average annual precipitation for the State as a whole is 52.44 in., varying from 50 in. in the middle and northwestern parts of the State to about 66 in. along the shores of Mobile Bay and the Gulf of Mexico.

The factors controlling the climate of the State "all tend toward a temperate and comparatively uniform climate, with extremes of temperature uncommon. Freezing temperature rarely continues longer than 48 consecutive hours; this is especially true of the southern portion. The summers, while long, are not extremely warm. . . . The rainfall is fully sufficient for agricultural needs, and generally well distributed. The growing season is so extended that two, and sometimes three, minor crops are raised on the same ground in one year."

**Meteorological observations, [July–August, 1931]**, C. I. GUNNESS and F. R. SHAW (*Massachusetts Sta. Met. Ser. Buls. 511–512 (1931), pp. 4 each*).—Summaries of observations at Amherst, Mass., during July and August, 1931, are given, with normals and extremes for these months during previous years.

**Meteorological tables**, D. A. SEELEY (*Mich. State Bd. Agr. Ann. Rpt. Sec., 69 (1930), pp. 73–86*).—Daily and monthly summaries of temperature, precipitation, cloudiness, and sunshine, and monthly summaries of pressure, wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos), at Lansing, Mich., are given for the year ended June 30, 1930. Mean temperature and total precipitation for each month since 1863 are also given.

**The growth of the sugar cane under Mauritius conditions as described by the logistic curve and as expressed in terms of temperature and soil moisture**, M. KOENIG (*Mauritius Dept. Agr., Sci. Ser. Bul. [14] (1929), Eng. ed., pp. 18, pls. 7*).—"A considerable amount of work was involved in the research, and the results obtained are important in that they indicate the possibility of expressing in a formula the relation between cane growth in Mauritius and the principal controlling weather factors, viz, heat and moisture."

**Some problems of modern meteorology.—No. 4, The present position of weather forecasting**, C. K. M. DOUGLAS (*Quart. Jour. Roy. Met. Soc. [London], 57 (1931), No. 240, pp. 245–253*).—The author states that the great local variations of weather in the British Isles have led to a tendency "to overestimate this factor and to place too much faith in the local weather expert." He would encourage amateur forecasting for short periods provided it is based on real knowledge, especially of local conditions, but "forecasts for long periods ahead are not to be encouraged, and sometimes verge on quackery." He is of the opinion that "the best results are obtained by combining the methods of the synoptic chart with local knowledge and the appearance of the sky . . . . Prediction involves not only a knowledge of the laws of weather, but also a continuous supply of the relevant data," which, however, is not now complete.

Some of the newer developments in theory and methods of forecasting are discussed. Attention is also called to the difficulty of accurately wording forecasts and to the lack of an adequate method of comparing "the degree of success attained with that due to pure chance."

**Seasonal variations in daylight, twilight, and darkness**, S. W. BOGGS (*Geogr. Rev., 21 (1931), No. 4, pp. 656–659, figs. 2*).—Tables and diagrams are given from which seasonal variations in daylight, twilight, and darkness may be determined for any latitude.

**A new spring balance for measuring water content of snow,** G. D. Clyde (*Science, 73 (1931), No. 1885, pp. 189, 190, fig. 1; abs. in Utah Sta. Circ. 95 (1931), p. 11*).—A spring balance for weighing snow cores, in studies by the Utah Experiment Station of mountain snow cover, is described and stated to be light, durable, and accurate.

## SOILS—FERTILIZERS

**The effect of drying and ultra-violet light on soils,** A. E. Mortenson and F. L. Duley (*Soil Sci., 32 (1931), No. 3, pp. 195–198*).—In an investigation at the Kansas Experiment Station, moist, sun-dried, and shade-dried soils were exposed in thin layers. From these layers, at intervals of a few minutes, the surface was skimmed off with a straightedge, while at frequent intervals the whole mass was mixed and the exposure to the radiation from a mercury vapor lamp continued, record here being made of laboratory and greenhouse results with soils, the treatment of 2 kg. of which in the manner above indicated occupied 2 hours. The properties the effects of ultra-violet light upon which were studied were bacterial activity, the content of water-soluble calcium, the rate of settling of the colloidal material, and the growth of the plants.

The ammonia content of the soil was slightly increased initially, the greater effects having been found in soils of which the drying or treatment with ultra-violet light or a combination of the two had been most severe. The ammonia content then decreased, after about 7 days, "to a very low point." The nitrate content was shown to have been reduced immediately after the treatment, after which it increased gradually through a period of several weeks. The ultra-violet treatment, when applied in addition to drying, reduced bacterial numbers only slightly more than did the drying alone.

The total water-soluble content of the soil was considerably increased by drying, "and a still further increase was obtained by exposure to ultra-violet light. This increase was slight but apparently consistent." With reference specifically to the calcium, "water-soluble calcium was almost doubled where the soil was dried in the sunshine and treated with ultra-violet light. The effect of the light was greatest on the undried soil and then decreased as the severity of the drying increased."

"The colloidal material in the dried samples settled out much more rapidly than did that in the untreated. The effect of ultra-violet light was greater on the dried samples than on the untreated, but in every case there was a marked increase in the rate of settling of the colloidal material due to the effects of the ultra-violet light." It is suggested that this effect may be due in part at least to the dehydration of the colloidal materials and possibly to a reduction of the charge on the particles, by the ultra-violet light. "The increase in soluble content in the treated soils is another factor that would induce more rapid settling."

The effects upon the growth of plants of the exposure of the soil to ultra-violet light were less definite (as indicated by red clover and alfalfa) than were the effects above noted, but "it seems quite possible that the ultra-violet radiation contained in sunlight may be sufficient to have some slight effect upon the properties of field soils."

**Effect of replaceable sodium on the physical character of alkali soils,** W. Gardner and E. Harris (*Utah Sta. Circ. 95 (1931), pp. 9, 10*).—The transmission constant has been measured for soils of varying percentages of sodium saturation, and on the basis of the experimental curves thus obtained an attempt has been made to compute the probable length of time required for restoring proper physical condition to soils variously affected with alkali.

**The effects of vegetation and climate upon soil profiles in northern and northwestern Wyoming,** J. Thorp (*Soil Sci., 32 (1931), No. 4, pp. 283–301, pls. 2, figs. 6*).—According to this contribution from the U. S. D. A. Bureau of Chemistry and Soils, differences in climate in this region are due to the great variation in elevation, differences in vegetation being closely allied with those of climate. The soils are grouped into six major classes based upon important profile differences. Soils are pale gray-brown on the desert and, with the exception of the sixth, or ashy-gray, group, become progressively darker with the increase in altitude and rainfall. The sixth group, associated with heavy conifer forests, is light colored. The first four groups belong to the pedocals (soils having horizons of lime accumulation). They are separated from one another chiefly on the basis of the darkness of the color of the A horizons. Groups 5 (black or brown) and 6 are both in humid zones, but differ greatly in profile characteristics because of the great difference in vegetative cover. Group 5 has a heavy sod of grasses and flowers with no trees, whereas group 6 has a heavy growth of conifers. Parent materials are frequently the same under both groups. An appended table gives "certain essential relationships between soils and precipitation and vegetation in this region."

**Soil profile studies.—III, The process of podzolization,** J. S. Joffe (*Soil Sci., 32 (1931) No. 4, pp. 303–323, figs. 4*).—The present contribution to the New Jersey series on soil profiles (E. S. R., 63, p. 210) presents a historical review of the subject; sets forth the theories of some of the important Russian investigators on the process of podsolization, comparing these with those of others and noting differences among the several viewpoints; discusses the relation of "ortstein" or pan formation to the process of podsolization and the mode of its formation and occurrence; takes up gley formation, pointing out that "gley formation on podsols indicates the termination of the podsol type of soil formation," and the beginning of the marsh or tundra type; touches upon the question of the relation of forest-gray soils to podsols; takes up and analyzes the position of brown earths or "Braunerde" in the podsolization zone, together with their relation to the type of forest vegetation and the process involved; and presents, finally, "a somewhat new aspect of the rôle of organic matter in the process of podsolization. . . . It seems that the speed of decomposition and mineralization of organic matter and the relation of the humates in the anion exchange reactions as worked out by Mattson with the isoelectric precipitates have an important bearing on the variations in the process of podsolization throughout the different belts of the podsol zone."

**Classification of water soils is proposed,** J. O. Veatch (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 20–23*).—Partly on the ground that "the greater part of the water-covered land supports a varied vegetation which has considerable significance in relation to the propagation and maintenance of fish, wild fowl, and aquatic fur-bearing animals, while the soil is also capable of producing plants more directly useful to man," the author expresses the opinion that "aside from an academic or purely scientific justification, this class of land and soil is deserving of study from economic considerations." He therefore presents a detailed and novel taxonomic scheme of classification, applicable to Michigan conditions, as tentative and suggestive. Some details of the grouping are briefly discussed.

**A study of the capillary rise of water under field conditions,** A. Sen (*India Dept. Agr. Mem., Chem. Ser., 10 (1930), No. 9, pp. 221–235, figs. 3*).—The evidence here presented, "in conformity with the present day idea of the capillary rise of water in soil," indicated a rise limited to a region within a few feet from the surface. Specifically, "moisture below 3 ft. can seldom move up to the surface and be available for plants unless the roots of the plants themselves go down to these depths. In Indo-Gangetic alluvium where there is a heavy rainfall of 40 to 45 in. in the course of three months and where the underground water table moves up to within 10 to 12 ft. from the ground level, the process of upward movement of moisture starts from the surface and drops downwards, although very slowly, as the drying season proceeds. Moisture below 5 to 6 ft. in these alluvia probably goes on percolating all the year round."

**[Soil chemistry notes from the Kentucky Station]** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 27, 28, 29, 30*).—The following items are noted.

*Effect of manganese, copper, and zinc on the growth of molds and yeasts.*—Minute quantities of the elements named showed themselves essential for the growth of molds and yeasts; and it is claimed that "ammonification of dried blood and other nitrogenous organic substances was accelerated, and alcoholic fermentation of cane sugar was stimulated by the addition of small quantities of compounds of each of these elements to synthetic cultures."

*Iodine in limestone and soil.*—It is stated that iodine was found to be determinable in 50-gm. samples of rock or soil by heating to about 1100° C. in silica tubes for two hours while drawing a slow current of air through the tube and into 10 per cent potassium carbonate, from which absorbent the iodine was extracted with alcohol after evaporating to dryness.

*Moisture determinations.*—The presence in a clay loam subsoil under a silt loam surface soil of "a considerable amount of total water . . . which the plants could not get" is said to be shown by moisture determinations on a soil area in which crops suffered from a lack of water. The figures are recorded in a table including also nitrate determinations on the same soil.

**Changes in composition of soybeans toward maturity as related to their use as green manure,** W. A. Albrecht and W. H. Allison (*Soil Sci., 32 (1931), No. 4, pp. 271–282, figs. 4*).—It was found "that the percentage of more readily soluble nitrogen in the soybean crop, including both tops and roots but especially roots, decreases as the plants grow older, whereas that of the carbonaceous matter usable by microorganisms mounts so rapidly that, as a green manure, the mature crop is a bacterial ration with excess of the crabonaceous matter and such deficiency of readily soluble nitrogen that its decomposition may jeopardize the soil's supply of available nitrogen for other crops." According to this communication from the Missouri Experiment Station, there is also "need for fuller chemical knowledge of the changes of the organic complexes of the plant as it becomes more mature and for a fuller knowledge of the decay of these complexes within the soil, so that chemical studies of green manures may more wisely guide their use for maximum effective nitrogen liberation in the soil."

**Some effects of legumes in relation to economical crop production,** R. C. Collison (*New York State Sta. Bul. 596 (1931), pp. 16, figs. 6*).—Some important effects of legumes as indicated by the lysimeter investigations of the station are presented, together with their relation to economical crop production, the nitrogen relations of legumes and nonlegumes being described from the standpoints of (1) their nitrogen content as affecting the growth of the crops which follow them; (2) crop yields after legumes and nonlegumes; (3) nitrogen removal in crops and nitrogen loss in legume and nonlegume rotations; and (4) fertilizer economics of legume rotations. The importance of the rooting habits of legumes on soil, plant growth, and the interchange of plant food materials and water utilization is emphasized, attention being drawn to the fact that "the proportion and distribution in the soil of the root system of legumes is a factor often overlooked in appraising their value to agriculture."

It was found that, the nitrogen content of the alfalfa plant being some 2.5 times as great as that of timothy, "this may show itself by a stimulation of crop growth due to a high nitrogen level after a legume, such as alfalfa, and a depressing effect on the crop which follows such a crop as timothy. In the lysimeters the increase in yields of barley immediately following alfalfa has amounted to as much as 43 bu. over that following timothy. The greatest increase in crops following alfalfa and the most marked yield depression in crops following timothy appear the first year after the alfalfa and timothy are spaded under. By the second year both effects have greatly declined.

"In spite of the fact that 3 times as much nitrogen has been removed by crops in the alfalfa rotation as in a timothy rotation, nevertheless in the former rotation, on the poorer soil, 2.5 times as much nitrogen has been lost in the drainage water." The great importance of utilizing this store of available nitrogen economically is pointed out.

**Fertilizing heavy soils increases alfalfa yields,** R. L. Cook (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 3-5*).—As a result of experiments on the fertilizer treatment of rotations including alfalfa with wheat as a nurse crop, grown on soils typical of the larger part of the eastern Michigan heavy soils area, "a rather general statement can be made to the effect that wheat which is to serve as a nurse crop for alfalfa on these soils should be treated with a liberal quantity of fertilizer containing a high percentage of phosphoric acid with moderate quantities of potash and nitrogen."

**A method of increasing the manurial value of mahua cake,** N. D. Vyas (*Agr. Research Inst., Pusa, Bul. 176 (1928), pp. 12*).—Having observed in treating bone meal with sulfur in the presence of sulfur-oxidizing bacteria that both the sulfur oxidation and the decomposition of the bone meal were accelerated by the addition of charcoal, the author successfully applied the same method to mustard seed press cake and to press cake resulting from the extraction of oil from the mahua seed. From 3 to 6 or more times as large a proportion of the very slowly available nitrogen was ammonified in 15 weeks as was so decomposed in the absence of the charcoal. Other similar experiments are recorded.

**The influence of lime on the recovery of total nitrogen in field crops,** J. G. Lipman, A. W. Blair, and A. L. Prince (*Soil Sci., 32 (1931), No. 3, pp. 217-233*).—Report is made from the New Jersey Experiment Stations of nitrogen determinations carried out "over a period of 20 years . . . on a variety of field crops grown on four separate 5-year rotations, with varying amounts of calcium and magnesian limestone. . . .

"The highest returns have been from the forage crops rotation where two crops a year—mostly legumes—have been grown 3 or 4 years out of the 5. Generally the corn crops have given the next highest returns and the vegetable and potato crops the lowest. . . . In most cases the yield of nitrogen was almost as high with 2,000 lbs. of the limestone as with 4,000 lbs. Taking the 5-year averages for the different rotations, the yields of nitrogen are very nearly the same with the calcium and magnesian limestone, though in some cases the latter gave slightly higher yields. For the most part the yields of nitrogen are higher for the fourth 5-year period than for the earlier periods. This would indicate that the general fertility level of the soil is being maintained, and perhaps slightly raised, under the systems of cropping employed.

"In nearly all cases unlimed plats returned less nitrogen and a lower crop yield than the limed plats. In the case of legume crops the limed plats almost invariably yielded dry matter with a higher percentage of nitrogen than the unlimed plats."

Tabulated data indicate the dry matter yields of the four rotations for the 10-year period 1918–1927, together with the percentages of nitrogen in the dry matter of the various crops for the period 1923–1927.

"Attention is called to the fact that no farm manure has been used and that the amount of commercial fertilizer applied has been moderate. Note is made also of the fact that the yields, as indicated by the total nitrogen returned, have increased slightly."

## AGRICULTURAL BOTANY

**The utilization of water by cultivated plants under field conditions** [trans. title], I. I. ISHAKOV (*Zhur. Opytn. Agron. Îugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *6* (*1928*), *No. 2*, *pp. 25–43*).—In the investigation, as reported, the calculation of the coefficient of water use was made in accordance with the following formula: $X=\frac{K(a-a')+A}{100p}$, where $X$ is the coefficient of the total water used, including also the moisture evaporated directly from the soil; $K$ the weight of a hectare of soil 1 meter deep; $a$ the percentage of moisture of the dead layer (the horizon which apparently does not contribute to the soil moisture) at the time of planting; $a'$ the percentage of moisture at the time of harvest; $A$ the amount of precipitation from the time of planting to the time of harvest in tons per hectare; and $p$ the yield in tons per hectare.

In summing up the results on the water requirement of various annuals, the following was concluded: (1) The longer the vegetative period of a plant, the less water it loses in the production of a unit of material grown. In this connection the results of the field experiments corroborate the findings of pot experiments. (2) The Giant oats constitute an exception, the coefficient being lower under field conditions when compared with Poltavka wheat. (3) The higher the yield of a plant the lower is the coefficient, and vice versa. (4) In the case of perennial grasses cut for hay, the coefficient increases with the age of the plant. (5) For young alfalfa, the coefficient is lower than for Poltavka wheat. Old grass has a higher coefficient. (6) The early grain crops (Poltavka wheat, oats, etc.) use 50 per cent of the moisture stored up in the soil during the fall and winter, the cultivated crops 33, and the perennial grasses 60 per cent.

The water utilization from the precipitation was as follows: Grain 50 per cent, cultivated plants 67, and alfalfa 34 per cent. The different methods of tilling the soil for the various crops have an influence on the coefficient of water expended. Medium or deep plowing has no effect. The later the spring grains are planted the higher the coefficient. Broadcasting the grains gives a less economical coefficient. Poltavka wheat uses less water per unit of dry matter when planted after the cultivated crops than when following grain. Manure promotes a more economical use of moisture for wheat and oats but not for corn.

**The relation of lime to the absorption of iron by plants,** W. P. ALLYN (*Ind. Acad. Sci. Proc.*, *43* (*1927*), *pp. 405–409*).—This paper contends, not that calcium carbonate bears no relation to chlorosis in plants, but that the conditions set up by the addition of excessive amounts of calcium carbonate do not render iron in the soil unavailable for plant absorption. The data are presented in tabular form.

Stalk tests indicate that the excessive use of calcium carbonate on soils does not render iron unavailable for corn plant absorption. Lime increases the deposition of iron at the nodes of corn plants, especially where the soil reaction is neutral or slightly alkaline, but heavy deposits of iron at the nodes of plants grown on heavily limed plats do not necessarily indicate a greater total absorption of iron by the plants. Manure or potash in appreciable amounts decreases very materially the deposit of iron at the nodes. These data indicate that lime-induced chlorosis is not a result of iron becoming locked up in the soil, but rather the result of a disturbance in the metabolism of iron after it has been absorbed by the plant.

**A laboratory study of oilseed plants** [trans. title], N. Tulaĭkov (*Zhur. Opytn. Agron. I͡ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *6* (*1928*), *No. 2, pp. 105–138*).—The author presents a progress report on the composition of sunflower, flax, and mustard plants and on the accumulation of oil as affected by the soil type, tilling methods, and care of the plants. The work was conducted with plants grown in field or greenhouse.

The accumulation of dry matter in sunflower was greater on the chestnut soil than on the columnar solonetz. This is shown by the results from six years' work, the samples being taken at various stages of growth. The weather also influenced the amount of dry matter accumulated. The most rapid accumulation of dry matter in sunflower occurred as the plants filled out, that is, during the ripening of the seeds. In the earlier periods of its growth, the sunflower accumulated very little dry matter. The accumulation of dry matter in the stem and the cup of sunflower continued to the time when the seeds began to fill out, then took place in the leaves and seeds. The rate dropped again in all parts of the plant after the ripening of the seeds.

The investigations with flax show the most intensive growth during blooming. The stems of flax provided 50 per cent of the dry matter of the crop and the seeds 30 per cent. The sunflower, as well as the flax, used the highest amount of water during the blooming period. The transpiration coefficient (amount of water necessary to produce a unit of dry matter) for sunflower under field conditions was equal to 487 and in the greenhouse 405. For flax, the transpiration coefficient varied within wide limits, depending on the rainfall. Under field conditions it was equal to 1,861 in 1924 and 492 in 1925.

The highest proportion of ash in sunflower was found in the leaves. Seasonal variations in respect to moisture did not seem to influence the ash content. Neither was there any great variation in the ash content of sunflower plants grown on chestnut or solonetz types of soil. The content of ash during the vegetative period was as follows: When the plants had two pairs of leaves only it equaled 17.8 per cent of the dry matter, at the time of cup formation 12.5 per cent, and at harvest 10.7 per cent. The highest proportion of ash (50 per cent) was found in the leaves, and the lowest in the roots (5 to 8 per cent). The $K_2O$ in the ash was equal to 35 per cent on the chestnut soil and 39 per cent on the solonetz. The phosphoric acid in the ash of the sunflower plant was equal to 4.5 per cent. The seeds contained a higher amount of $P_2O_5$, namely, 1.1 per cent of the total dry matter, the other parts of the plant containing 0.3 to 0.4 per cent. The plants grown on the solonetz showed a higher percentage of $P_2O_5$.

The amount of nitrogen was high in the early period of growth, then diminishing. The average for the 5-year period investigated on the chestnut soil was 1.59 per cent, with 1.48 per cent as the minimum. Greater variations were noted on the solonetz soil. In 1926 it was 1.47 per cent and in 1927 2.91 per cent. The accumulation of ash and nitrogen in flax continued to the time of harvest. At first the amount of ash in flax was 10 per cent of the total dry matter, but it lowered as the plants grew until it reached 6 to 6.5 per cent and this ratio persisted to the time of harvest. The amount of nitrogen fluctuated around 2.34 per cent, which the plant attained long before ripening.

**The rôle of coats in seed and fruits which respond to light during germination** [trans. title], B. N. AXENTJEV (*Bot. Centbl., Beihefte, 46 (1929), 1. Abt., No. 2, pp. 119–202, figs. 21*).—Details and data are presented as resulting from studies with *Rumex crispus*, *Bromus squarrosus*, *Cucumis melo*, *Nigella arvensis*, *Amaranthus retroflexus*, *Phacelia tanacetifolia*, *Androsace maxima*, *Epilobium hirsutum*, *Oenothera biennis*, and *Silene densiflora*. The range of such influence, which may be positive or negative, appears to be wide. The process of oxidation may be hastened or hindered as regards the germinating parts.

**Effect of nitrate salts upon growth and composition of tobacco leaves,** A. R. C. HAAS (*Bot. Gaz., 88 (1929), No. 1, pp. 96–102, fig. 1*).—The author notes the claims that Valleau and Johnson have been able to bring about recovery of tobacco leaves from frenching by means of nitrogen fertilization (E. S. R., 57, p. 515), and also to bring back to normal growth frenched plants in soil to which was added a complete nutrient, or nitrogen as in nitrate of sodium, potassium, or calcium, or sulfate of ammonia. In studying the effect of the action of the cation added to the soil when the nitrate was added in each case, ammonium, sodium, potassium, calcium, and magnesium nitrate were used, respectively, for the various soil cultures.

It is claimed that frenching of tobacco leaves appears when nitrate becomes deficient, and disappears when sufficient nitrogen is applied to the soil. Continual additions of nitrate to soil before and during growth of tobacco plants affect the base exchange complex in the soil, and consequently the bases absorbed by the leaves; such continual additions of ammonium nitrate producing toxic conditions in the tobacco leaves.

The recovery of tobacco from frenching after the application of nitrate does not appear to bear any direct relationship to the recovery of pecan trees from rosette following the use of legumes.

**Succession in the vegetative cover of the sands in the Kalmytsk steppe and measures for improvement in this process** [trans. title], L. L. BEGUCHEV (*Zhur. Opytn. Agron. Ûgo-Vostoka (Jour. Expt. Landw. Südost. Eur.-Russlands), 6 (1928), No. 2, pp. 45–56, figs. 4*).—The author points out that one of the most efficient plants to cover the sand hills in the steppes which are subject to blowing away by the wind is *Elymus giganteus*. Whenever the sand movement has been stopped by the binding action of this plant, other species appear, one of the more common being *Agriophyllum arenarium*. After these plants and a few related species have established themselves the moisture content becomes too low, and other species supplant them, one of the first to come on being *Artemisia scoparia*. At the time when this plant is about to die off *Corispermum nitidum and Salsola kali* make luxuriant growth. Later on *A. maritima*, a perennial, appears. In the northern part only of the hinter-Volga semidesert *Salix caspia* may be found.

As improvement measures the author suggests the development and adaptation of the native flora by selective breeding. He points out the value of the grasses for grazing. *E. giganteus* contains between 8.7 and 9.16 per cent ash, 3.7 and 3.74 fat, 29.78 and 36.06 cellulose, 11.81 and 20.93 protein, and 27.65 and 39.73 per cent nitrogen-free extract. *Salsola kali* and *C. nitidum* serve as good pastures for camels. Analyses of a few other desert plants are given.

**Hydrogen ion studies of water, peat, and soil, in relation to ecological problems at Bacon's Swamp, Marion County, Indiana,** S. A. Cain (*Ind. Acad. Sci. Proc., 43 (1927), pp. 395–401*).—It is concluded from this work that in the lowland forest particularly there appears to be a definite downward gradient in pH concentration, alkalinity increasing with soil depth. The peat samples were all more or less acid.

In the hydrophytic associations there is a diurnal trend in pH, the habitats being most acid in the morning and less acid after photosynthesis, and this trend being directly correlated with the respiratory-photosynthetic ratio. Peat samples show little change in pH.

In both soil and aquatic habitats there appear certain pH ranges within which the various associations are found. In most instances the ranges of the different associations overlapped or broadened, so that little emphasis can be placed on acidity as a limiting factor in the present vegetation.

**Ecological relationships of fungi in cultures,** C. L. Porter (*Ind. Acad. Sci. Proc., 43 (1927), pp. 391–393*).—Both inhibitory and stimulative relationships are indicated.

**Mycorrhiza bearing species in the vicinity of Lafayette, Indiana,** K. D. Doak (*Ind. Acad. Sci. Proc., 43 (1927), pp. 427–439, figs. 5*).—A bibliography and review are given of mycorrhiza in general and of local instances.

Ectotrophic mycorrhizas most common on forest trees are in general favored developmentally by leaf mold or other surface organic deposits. The fungi producing mycorrhizas on species of Quercus are more nearly dependent upon this condition. The production of mycorrhizas by various fungi on the same plant has been observed in Fagus and Quercus. The like agency of still others is inferred from indications.

A compound mycorrhiza of *Quercus bicolor* gives some evidence that the attraction forces of certain fungi toward young growing roots of trees are greater than the inhibiting forces between two fungi. An incompletely formed mantle frequently found on the roots of *Cercis canadensis* indicates that the rate of growth in the fungus may be a determining factor in mantle formation.

**Bacterial antagonism, with special reference to the effect of Pseudomonas fluorescens on spore forming bacteria of soils,** I. M. Lewis (*Jour. Bact., 17 (1929), No. 2, pp. 89–103, figs. 4*).—It is stated that *P. fluorescens* produces a thermostable, filtrable, dialyzable bacteriotoxin which is both inhibitory and bactericidal. The toxin, though not specific in its action, is more active against certain species than against others. Fungi are more resistant than bacteria. Spore-forming bacteria and micrococci are very sensitive, while colon bacteria are resistant. The substance is not isoinhibitory. The amount of toxin produced depends upon the composition of the culture medium and the availability of oxygen, the maximum occurring in cultures grown on slopes of Uschinsky's agar. The toxin persists longer in agar than in broth and resists desiccation for long periods. It is soluble in alcohol and is adsorbed by substances in soil and by charcoal. It is produced in sterilized manured soils inoculated with *P. fluorescens*, though alcoholic extracts from such soils are inhibitory for the more sensitive species only. Soils which have supported a vigorous growth of *P. fluorescens* are suitable for the growth of *Bacillus cereus* after sterilization. Soil samples from fields, gardens, pastures, and meadows failed to yield toxins by the extraction methods employed for the pure cultures. It is thought that the toxin here studied is of a different nature from that of the thermolabile substances reported by others from soils.

**Nomenclature of the root-nodule bacteria of the Leguminosae,** I. L. Baldwin and E. B. Fred (*Jour. Bact., 17 (1929), No. 2, pp. 141–150*).—The authors point out features conditioning difficulties in Bergey's Manual of Determinative Bacteriology (E. S. R., 56, p. 326), and they present a proposal in which species identification is based upon the morphology, cultural characters, physiological properties, and serological reactions of the bacteria. It is proposed that several different species be established, and five are presented in this paper, *Rhizobium leguminosarum*, *R. trifolii*, *R. phaseoli*, *R. meliloti*, and *R. japonicum*.

## GENETICS

**Genetics and evolution,** M. Caullery (*Science, 74 (1931), No. 1915, pp. 254–260*).—A discussion of evolution in which the author expresses his belief but points out that positive proof of factors influencing evolution is lacking.

**Elements of biology and genetics applied to the improvement of cultivated plants,** F. Boeuf (*Éléments de Biologie et de Génétique Appliqués à l'Amélioration des Plantes Cultivées. Tunis:* [*École Colon. Agr. Tunis*], *1927, pp.* [*4*]*+273+III, figs. 19*).—The first part (pp. 1–131) of this book, the basis of a professional course in the Colonial School of Agriculture of Tunis, is devoted rather to an exposition of the general conceptions of biology and evolution; the second part (pp. 132–273) to methods of improvement of the plants, including particular technic for such plants as wheat, barley, oats, flax, and cotton.

**The experimental modification of heredity in crop plants, I, II,** L. J. Stadler (*Sci. Agr., 11 (1931), Nos. 9, pp. 557–572, figs. 9; 10, pp. 645–661, figs. 6*).—These lectures, contributions from the Missouri Experiment Station cooperating with the U. S. Department of Agriculture, discuss in part 1 induced (irradiation) germinal changes which may be traced to chromosomal irregularities and in part 2 induced changes apparently limited to the individual gene.

**Genic analysis in Avena,** H. Matsuura (*Jour. Faculty Sci., Hokkaido Imp. Univ., Ser. V, 1 (1931), No. 2, pp. 77–107*).—The author has reviewed available literature concerned with the behavior in inheritance of color, panicle, and grain characters and other morphological and certain physiological characters in oats. The characters analyzed are listed according to genetic behavior, linkages are indicated, and a bibliography of 79 titles is appended.

**Inheritance of type of floret separation and other characters in interspecific crosses in oats,** V. H. Florell (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 4, pp. 365–386, pls. 6, figs. 2*).—The mode of inheritance of the type or manner of attachment of the oats spikelet to its peduncle and of the florets to their rachilla segments and the subsequent separation of the florets at maturity were studied by the California Experiment Station in cooperation with the U. S. Department of Agriculture in crosses between *Avena fatua* and *A. sterilis* and between these species and several cultivated varieties of *A. sativa* and *A. byzantina*. The four species belong to the 42 (2*n*) chromosome group.

The type of floret separation seemed to be governed by a unit factor in two crosses of *A. fatua* × *A. sterilis*, three of *A. sterilis* × *A. sativa*, and one of *A. fatua* × *A. byzantina*. *Sterilis* rachilla floret separation by basifracture was dominant in $F_1$ in all crosses. In the cross *A. byzantina* var. Coastblack × *A. fatua* a two-factor difference for type of floret separation was found with $F_2$ segregation of 15 nonarticulate to 1 articulate, and the factor relationships suggested by $F_2$ data were verified in $F_3$. The true-breeding families included a new recombination *sterilis*-like type termed synthetic *A. sterilis*. Brown lemmas were dominant to grayish-white lemmas and hairy to glabrous lemmas in $F_1$ of *A. fatua* × *A. sterilis ludoviciana*, single factor differences being suggested in both cases. In this cross type of floret separation and hairiness of lemma segregated independently.

Strongly geniculate and twisted awns and *fatua* (hairy) rachilla apparently were completely linked in all crosses except *A. fatua* × *A. byzantina* var. Fulghum, wherein slight crossing-over occurred, resulting in wild *sterilis* and apparently *sativa*-like plants. Strongly geniculate and twisted awns and hairy rachilla seemed to remain completely linked in *A. sterilis*, and such linkage was noted in the wild forms. The hairiness of lemma was almost completely linked with brown color in *A. fatua* × *A. sterilis ludoviciana*. The wild oat complex of associated characters consisting of spikelet articulate in a large oval pitted callus surrounded by a ring of short stiff hairs, hairy rachilla, and strongly geniculate and twisted awns on the first two florets appeared to be controlled by two or more closely linked factors. The solidified spikelet attachment and awns weak or nearly wanting are associated in the cultivated varieties.

**Linkage relations in barley,** A. DAANE (*Minnesota Sta. Tech. Bul. 78 (1931), pp. 30*).—The interrelations of certain character pairs were studied in crosses involving B17, a 6-rowed barley (*Hordeum vulgare*), B1, a 2-rowed type (*H. deficiens*), B3, a 2-rowed barley (*H. distichum*), and B11, a 6-rowed barley (*H. vulgare*). In the $F_2$ progenies of these crosses single factor differences were exhibited by the character pairs *Aa*, normal v. virescent seedlings; *Vv*, non-6-rowed v. 6-rowed; *Bb*, black v. white glume color; *Kk*, hooded v. awned; *Rr*, rough v. smooth awn; *Nn*, hulled v. naked caryopsis; *Ss*, long- v. short-haired rachilla; and *Pp*, purple v. white pericarp. There was independent inheritance between *Aa* and *Bb*, *Nn*, *Rr*, *Ss*, and *Kk*; *Vv* and *Bb*, *Nn*, *Rr*, and *Kk; Bb* and *Nn*, and *Rr; Nn* and *Rr; Rr* and *Pp;* and *Ss* and *Pp*. *Aa* was found to be linked with *Vv* and *Pp*, with about 27 per cent crossover between *Aa* and *Vv* and about 18 per cent between *Aa* and *Pp*. A second linkage group established was between *Rr* and *Ss*, with a crossover of about 18 per cent.

**Inheritance of awns in a Kota × Hard Federation cross,** G. STEWART and B. I. JUDD (*Jour. Amer. Soc. Agron., 23 (1931), No. 6, pp. 455–464, figs. 4; abs. in Utah Sta. Circ. 95 (1931), p. 14*).—Examination of $F_3$ progeny rows of Hard Federation (awnless) × Kota (awned) wheat, grown at the Utah Experiment Station, revealed four classes of $F_2$ genotypes breeding true and five classes segregating each in a distinct manner. The ratios of families breeding true for awns in various ways suggested a two-factor difference, independently inherited. $F_4$ and $F_5$ generations gave further confirmation of the $F_3$ behavior.

**Genetic studies of the pineapple.—I, A preliminary report upon the chromosome number and meiosis in seven pineapple varieties (Ananas sativus Lindl.) and in Bromelia pinguin L.,** J. L. COLLINS and K. R. KERNS (*Jour. Heredity, 22 (1931), No. 5, pp. 139–142, figs. 2*).—In seven varieties of pineapples there were found 25 haploid chromosomes in the pollen mother cells and in three of the varieties 50 diploid chromosomes in the root tip cells. In all cases the chromosomes were almost spherical in shape and of very small size. Meiosis was quite regular. In *B. pinguin*, a closely related species, there were 48 haploid chromosomes. In six triploids located in the $F_1$ hybrid population of a cross between the Cayenne varieties and a wild Brazilian pineapple, there were 75 haploid chromosomes.

**A preliminary account of chromosome behaviour in the Pomoideae,** A. A. MOFFETT (*Jour. Pomol. and Hort. Sci., 9 (1931), No. 2, pp. 100–110, figs. 11*).—On the hypothesis that the supposedly 34-diploid chromosome condition in the apple is really a complex polyploidal condition of seven types, three of which are represented six times and four four times, chromosome determinations were made of a number of Pomoideae. The expectation that the basic number of chromosomes would be 17 throughout the group was borne out by the study, although diploid, triploid, and tetraploid forms were noted. At the first metaphase of pollen mother cell divisions in diploids, secondary pairing of chromosomes was observed in all the forms studied, suggesting an affinity between chromosomes within each set of the diploid. Secondary pairing was also observed in triploids and tetraploids. Multivalent associations were found in the diploids and correspondingly higher associations in triploids and tetraploids. The number 17 is deemed a secondary basic number and the derived series of polyploids, 34, 51, and 68, secondary polyploids. The author suggests that in Pomoideae the chromosome constitution secondarily balanced has probably given rise to the distinctive morphological characteristics of the group; in other words, a new type of chromosome organization has given rise to a specialized fruit type.

**Chromosome linkage in certain Oenothera hybrids,** R. R. Gates and F. M. L. Sheffield (*Roy. Soc. London, Phil. Trans., Ser. B, 217 (1929), No. B 446, pp. 367–394, pls. 2, figs. 7*).—This detailed account covers five generations of hybrids from *Oenothera* (*biennis*×*rubricalyx*)×*ammophila* and *O. ammophila*×(*biennis*×*rubricalyx*), and presents their cytological peculiarities. The chromosome linkages are thought to offer a means of explaining some of the genetical behavior manifested in these and similar hybrids. The cytological results of chief significance concern the linkages between chromosomes. It is thought that a relation exists between the linkage of chromosomes and the genetic linkage which is so characteristic a feature in Oenothera.

**Influence of magnesium salts on the fertility of a clon of Veronica chamaedrys** [trans. title], V. S. Korzhevin (Korshevine) (*Izv. Glav. Bot. Sada S. S. S. R.* (*Bul. Jard. Bot. Princ. U. R. S. S.*), *27 (1928), No. 3, pp. 340–348; Eng. abs., pp. 347, 348*).—In vegetative reproduction of the self-sterile species *V. chamaedrys*, the plants in a clon are as sterile among themselves as are the flowers of an individual, this fact suggesting as causal the physiological homogeneousness of the plants in a clon. To solve the question whether external influences can alter this physiological homogeneousness, separate plants of a clon were subjected to the influence of different salts, and it was found that treatment with $MgCl_2$ and $MgSO_4$ induce a sharp fertility increase. A description, with tabulation, is given of one such experiment. The clon was formed of three plants here denoted as $a_1$, $a_2$, and $a_3$. Pot $a_2$ was treated in autumn with dry $MgCl_2$ and next spring the plants were mutually pollinated. The results are tabulated.

All fruits obtained from $a_1 \times a_2$ and $a_3 \times a_2$ were normally developed, containing 9 to 15 seeds. Pollination $a_1 \times a_3$, which was serving as control, gave one fruit containing 2 seeds, and like results were obtained in other cases wherein $MgCl_2$ was applied. The influence of $MgSO_4$ was less marked. The application of the salts $KNO_3$, NaCl, $CaCl_2$, $CaHPO_4$, and $(NH_4)_2SO_4$ gave no perceptible results.

**Preliminary investigations on the occurrence of sterility in rice (O. sativa),** K Ramiah (*Agr. and Livestock in India, 1 (1931), No. 4, pp. 414–426, pls. 3, fig. 1*).—The common form of sterility discussed, where a varying number of spikelets in the panicle remain unset though interspaced with well-set spikelets, is due to both environmental, especially seasonal, and hereditary influences. It occurred to a small extent in many pure line collections at the Paddy Breeding Station at Coimbatore and extensively in a few every year.

The inheritance of this character is complex and is not yet completely solved. Sometimes when parents of a cross seem absolutely free from this defect the $F_2$, $F_3$, and later generations of the cross exhibit it to a varying extent. The progenies of artificial crosses showed a partial association of the character with presence of anthocyan pigment in the organs, duration of the plant, degree of emergence of the panicle, and size and arrangement of grain in the panicle. In crosses attempted between *Oryza sativa* and *O. longistaminata* and *O. latifolia*, single fertilization was evident instead of the usual double due to abnormal nuclear division. Critical examination of varieties with much sterility showed that its incidence is largely confined to spikelets flowering toward the end of the blooming period, these usually being at the base of the bottom branches of the panicle. The floral parts of the sterile spikelets revealed that sterility is due to uneven maturity of the pollen and the stigma, aborted pollen, and nonfunctioning of the pollen, even when well formed. In a few instances sterility may be due to defective stigma.

**Development of the macrogametophyte and embryo of Daucus carota,** H. A. Borthwick (*Bot. Gaz., 92 (1931), No. 1, pp. 23–44, figs. 32*).—In this study at the University of California of the development of the female gametophyte, the pollen tubes, and the embryo of the carrot it was observed that a single archesporial cell functions directly as a macrospore mother cell which produces a linear tetrad of macrospores. The macrogametophyte which arises from the chalazal macrospore is of the seven-celled type characteristic of most angiosperms. The presence of a cellulose filiform apparatus was demonstrated.

Pollen tubes were observed to grow intercellularly down the conducting tissue of the style to its base and then superficially along a groove leading to a canal communicating with each locule. Of the eight cells in the embryo the three farthest from the micropyle gave rise to all the embryo except the root tip, which with the suspensor originates from the other five cells. The mature embryo may arise entirely from the distal cell of the four-celled embryo or from the distal and derivatives of the adjacent cell, thus indicating that Souèges' theory that in any one species the four cells of the embryo always give rise to the same parts of the embryo may not hold.

**A survey of animal-breeding research in the United States** (*Washington: Natl. Research Council, Com. Anim. Breeding, 1931, pp. [1]+35*).—A committee report of a survey of animal-breeding research under way at the State agricultural experiment stations and the U. S. Department of Agriculture.

**The probability of homozygosity (AA) of dominant types in case of complete dominance in monohybrid segregation** [trans. title], S. Berge (*Ztschr. Induktive Abstam. u. Vererbungslehre, 58 (1931), No. 1, pp. 157–165*).—Theoretical explanation is given for calculating whether an animal expressing a dominant characteristic is homozygous or heterozygous, based on the character of the offspring produced in parent-offspring matings and in matings with known heterozygous individuals. The number of matings needed to prove homozygosity with different degrees of certainty are calculated.

**The presence of a factorial basis for characters lost in evolution: The atavistic reappearance of digits in mammals,** C. R. Stockard (*Amer. Jour. Anat., 45 (1930), No. 3, pp. 345–377, figs. 12*).—The results of a study of the appearance of extra digits in guinea pigs and dogs are reported. No clear-cut method of inheritance is suggested for the character in guinea pigs, but by selection for five generations 100 per cent of the offspring showed extra toes in various degrees of perfection. An individual also appeared with thumbs on the front feet. In dogs the results from several matings between Great Danes—a breed which lacks a great toe—and St. Bernards—a breed having the great toe present—indicated that the inheritance of the great toe reacts as a single dominant factor. A tendency toward doubling of the great toe, also observed in St. Bernards, while clearly not a recessive did not behave as a single factor dominant.

In discussing the results, polydactyly being a doubling of a digit is suggested as an early expression of the mutant condition causing suppression of pre- and postaxial digits. The reappearance of normally absent digits is considered as being due to the selective elimination from the germ plasm of the mutant condition bringing about polydactyly and digital reduction.

**Inheritance of body weight in domestic fowl,** N. F. WATERS (*Natl. Acad. Sci. Proc., 17 (1931), No. 7, pp. 440–444*).—A brief account of the results of the study previously noted (E. S. R., 65, p. 820).

**Cold blackening of white hair and red albino eyes, a chapter in genetic development** [trans. title], W. SCHULTZ (*Schr. Phys. Ökonom. Gesell. Konigsb., 67 (1930), No. 1, pp. 1–32*).—The author gives a discussion of the influence of temperature on pigmentation, bringing out especially the possibilities of influencing the production of pigment in white hair by lowering the temperature of the hair roots.

**A reverse mutation from "dilute" to "intense" pigmentation in the house mouse,** C. E. KEELER (*Natl. Acad. Sci. Proc., 17 (1931), No. 8, pp. 497–499*).—An account is given of a short-eared intense female which developed in a strain of short-eared, blue dilute mice at the Bussey Institution. On mating this female to a dilute male two litters were produced, one of which contained two dilute offspring and the other three intense offspring. It was assumed that the female was heterozygous for intensity of pigmentation as a result of a mutation of one of the two gametes from which she originated.

**A study of hair growth in the guinea-pig (Cavia cobaya),** H. L. DAWSON (*Amer. Jour. Anat., 45 (1930), No. 3, pp. 461–484, figs. 8*).—In a study of the character of the hair and hair growth on 3 areas on 15 guinea pigs, 5 distinct types of hair were found. The growth period varied from 2 to 7 weeks, depending on the ultimate length of the hair and other conditions, such as pregnancy. There was no correlation between the periods of growth, periods of rest, and types of hair.

**A quantitative study of the polar body of the ferret, with a note on the second polar spindle,** D. MAINLAND (*Amer. Jour. Anat., 47 (1931), No. 2, pp. 195–240, figs. 5*).—A study of serial sections of 86 ova of the ferret indicated that polar bodies were not absent because of migration through the oolemma or because of failure of separation of the polar bodies from the ovum. Degeneration of the polar bodies was strongly indicated as a cause for their absence. The division of the first polar body can be completed, and the spindle fibers disappear before fertilization. It also appeared that the first polar body in some cases failed to divide. There was a suggestion of a nucleus in only two of the polar bodies observed.

Based on six specimens in the prophase stage the maximum haploid chromosome count appeared to be 13.

**The structural basis for the response of the comb of the Brown Leghorn fowl to the sex hormones,** M. HARDESTY (*Amer. Jour. Anat., 47 (1931), No. 2, pp. 277–323, figs. 15*).—A study of the structures of the comb as influenced by the male sex hormone showed that castration prevents the formation of the mucoid in the intermediate layer of the dermis. Supplying the sex hormone to the caponized bird stimulated the cells of the intermediate layer to secrete mucoid. The comb of the laying hen has an intermediate layer similar to that of the cock, but less well developed, and in the nonlaying hen the mucoid disappears. The origin of the comb and behavior of comb grafts are described, and it is noted that the graft and stump each develop into only that part of the comb which they would have formed had the comb been left intact.

**Ovarian hormone effects in ovariectomized monkeys,** D. C. ROBERTSON, W. P. MADDUX, and E. ALLEN (*Endocrinology, 14 (1930) No. 2, pp. 77–88, figs. 20*).—Injections of ovarian hormones into four ovariotomized adult female monkeys induced menstrual periods following cessation of the injections in two cases. Menstrual endometrium typical of the nonovulating type was found on histological examination. Implantation of human corpora lutea did not increase the development of the endometrical glands beyond the interval stage. The epithelial lining of the uterine tubes and the mammary glands showed considerable recovery following the injections. The presence of considerable amounts of glycogen in the epithelial tissue of the uterus and vagina was demonstrated as a result of the injection of the ovarian hormone.

## FIELD CROPS

**A method of laying out experiment plats,** R. J. GARBER, T. C. MCILVAINE, and M. M. HOOVER (*Jour. Amer. Soc. Agron., 23 (1931), No. 4, pp. 286–298, fig. 1*).—A method for laying out triplicate plats for long time field experiments is described in this contribution from the West Virginia Experiment Station. Uniformity crops, corn in 1927, oats in 1928, and wheat in 1929, were harvested from an area involving more than 450 plats of $\frac{1}{57}$ acre net each, and on the basis of correlation studies and other pertinent data the relative yields of the corn and oats were used in establishing the location of replicated plats. The plan adopted was to locate all the plats of a particular experiment in a more or less restricted area and so that the average deviations of triplicated plats in an experiment were of about the same magnitude. The triplicated plats were as widely distributed as possible over the area involved for a particular experiment. A high coefficient of correlation, $+0.85 \pm 0.01$ for grain and $+0.84 \pm 0.01$ for straw, was obtained between the yields of wheat, as determined from 5 rod rows removed from each plat and the yields as determined from harvesting the entire net areas of the same plats.

**Breeding for yield in crop plants,** C. M. WOODWORTH (*Jour. Amer. Soc. Agron., 23 (1931), No. 5, pp. 388–395, fig. 1*).—The inherent factors affecting seed yield in such self-fertilized crops as wheat, oats, barley, and soybeans are discussed in this contribution from the Illinois Experiment Station.

**[Field crops experiments in Kentucky]** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 25, 26, 27, 28, 37, 38*).—The use of sodium nitrate in watering transplanted tobacco plants is not considered desirable, since permanent injury resulted from 8 lbs. in 50 gal. of water used at the rate of 0.25 pint per plant and considerable early injury from 4 lbs. in 50 gal. when 0.5 pint was used. Fertilizers would better be applied in the row well mixed with the soil. Rotations wherein tobacco follows orchard grass sod again gave good results where manure or nitrogen fertilizers were used, while tobacco after alfalfa continued to give a poor quality of leaf. In 3-year rotations manure greatly benefited both yield and quality of leaf, the tobacco-wheat-clover sequence giving better leaf than the tobacco-wheat-soybean rotation and both better than the tobacco-redtop rotation. A strain of White Burley developed recently shows high resistance to black root rot and good yield and quality.

Certain Kentucky-grown red clovers again were much superior to most sorts from outside the State. No foreign clover survived the winter with more than a 20 per cent stand, and the French strain failed completely. Crown rot caused heavy mortality in the Russian and certain northern and western domestic clovers during the spring of 1930, whereas Kentucky 101 was highly resistant to the disease. Kentucky 101 seemed to contain appreciably more polysaccharides and less reducing sugars in both tops and roots than certain French and Oregon clovers, with other constituents present in about equal quantities. A direct correlation was shown between polysaccharide content of the roots and soil productivity, whereas the protein content appeared to have an inverse relationship. These chemical differences may explain winter hardiness in adapted clover and the greater success of clover on favorable soil. Red clover, among forage crops analyzed, contained the largest percentage of iodine, suggesting that it may be an important carrier of iodine in the diet of dairy cows and other farm animals.

Korean lespedeza, alfalfa, and wheat were productive at the Western Kentucky Substation in spite of severe drought. Wheat responded substantially to complete fertilizers, yields usually being best in a rotation after legumes when treated with limestone and phosphate and top-dressed with nitrate. Pasture treated with rock phosphate or lime and superphosphate again made heavy gains in beef over untreated areas. The changes in vegetation in response to treatment are recorded as heretofore (E. S. R., 64, p. 130).

**[Field crops at the Williston, N. Dak., Substation, 1930–31],** E. G. SCHOLLANDER (*North Dakota Sta. Bul. 248* (*1931*), *pp. 7–24, 25–34, figs. 7*).—Variety tests with common spring and durum wheat, oats, corn, barley, flax, field peas, alfalfa, sweetclover, and millet; trials of Triumph potato strains and improvement by the tuber unit method; a study of losses due to delay in the harvest of cereals, as in combine harvesting; and crop rotation and crop sequence studies are reported on again (E. S. R., 63, p. 828). Table show the results of analyses and baking tests of wheats of the 1929 crop and the comparative yields of corn, wheat, oats, and barley.

**[Agronomic investigations of the Imperial Institute of Agricultural Research, Pusa, 1929–30],** W. H. HARRISON, F. J. F. SHAW, J. SEN, T. S. VENKATRAMAN, N. L. DUTT, and W. SAYER (*Imp. Inst. Agr. Research, Pusa, Sci. Rpts. 1929–30, pp. 2, 3, 6, 10–29, 31, 32, 35–40, 80–94, 147–156, 158–165, pls. 3*).—Continued research with important field crops of India (E. S. R., 63, p. 333), in addition to variety, cultural, and fertilizer trials, included breeding work with wheat, oats, rice, corn, barley, sugarcane, tobacco, flax, sesame, *Cajanus indicus*, gram, peas, beans, lentils, hemp, and *Hibiscus* spp.; curing studies with tobacco; potato storage tests; study of the effects of nutrients on quality of sugarcane juice; sugarcane×sorghum hybrids (E. S. R., 63, p. 827); and studies of controlled arrowing and crossing, pollen and seed germination, and the performance of Coimbatore (Co.) seedlings, all with sugarcane. The usual account of sugar production in India is included.

**Factors influencing the establishment of irrigated pastures in northern Colorado,** H. C. HANSON (*Colorado Sta. Bul. 378* (*1931*), *pp. 53, figs. 15*).—An ecological analysis of factors and principles involved in the establishment of irrigated pastures in northern Colorado was made from data obtained on ten pastures under farming conditions. On eight pastures the seed mixture was analyzed, and on all the composition of the vegetation was determined by the quadrat method in each of the three to four years under study.

For irrigated pastures in the region the principal tame forage plants to choose from include smooth bromegrass, meadow fescue, orchard grass, timothy, Kentucky bluegrass, slender and crested wheatgrass, redtop, yellow and white sweetclover, white, alsike, and red clovers, and black medic.

Major factors discussed as influencing the establishment of irrigated pasture comprise purposes of the pasture, topography, soil conditions, climate, irrigation water supply, seed bed preparation, the seed mixture and species competition, the nurse crop, planting, weeds, grazing and mowing, and management. In determining the proportion of the seed of each species, the rancher should consider establishment and competition, weak v. aggressive species, quality and purity of seed, correct proportions, and the optimum effective quantity of seed of each species and total quantity of seed planted per acre for each combination of conditions.

**A botanical study of pasture formation,** E. W. Fenton (*Ann. Appl. Biol., 18 (1931), No. 3, pp. 334–351, figs. 5*).—Observations during 1925, 1926, and 1927 on pasture plats and hay subplats sown to different seeds mixtures on the Seale-Hayne Agricultural College Farm in Devonshire revealed the value of wild white clover, Italian and perennial ryegrasses, rough-stalked meadow grass, and orchard grass for pasture mixtures. Timothy and red clover appeared more desirable for meadows than for permanent pastures.

**A quarter century of dry-farm experiments at Nephi, Utah,** A. F. Bracken and G. Stewart (*Jour. Amer. Soc. Agron., 23 (1931), No. 4, pp. 271–279*).—Essentially an abridged account of work noted earlier (E. S. R., 64, p. 433).

**Small grain crops in Alabama,** R. Y. Bailey and J. L. Seal (*Alabama Sta. Circ. 60 (1931), pp. 19, figs. 7*).—Production practices are outlined for small grains. Planting and fertilizer trials with oats are reported on, and the relative yields of varieties of oats, wheat, and rye are tabulated, with recommendations for harvesting, use of small grains for hay (E. S. R., 65, p. 331) and grazing, and the control of smuts and rusts of oats and wheat.

Plowing before planting increased oats yields about 7 bu. per acre. Oats yielded about the same whether broadcasted or drilled, suggesting that drilling did not reduce injury from cold. Oats drilled October 15 in unplowed cotton middles outyielded oats planted November 15 on plowed land. Fall-sown oats produced twice as much as spring-planted oats. Wheat should be planted from October 15 to November 1, and rye for grazing after the first rain in September, and acre rates are for oats 2 to 3 bu. and wheat or rye 4 to 6 pk.

Oats receiving ammonium sulfate, urea, or Leunasalpeter slightly outyielded those receiving sodium or calcium nitrate. Yields increased with sodium nitrate applications up to 300 lbs. per acre, but increases from additional sodium nitrate were too small for profit.

**Harvesting Michigan's alfalfa seed crop,** P. R. Miller (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 31–33*).—A questionnaire to more than 100 certified alfalfa seed growers revealed that the majority harvest when pods are from two-thirds to three-fourths brown, cut in early morning while dew is on, always harvest seed from the first crop, use the mower with windrow or pea attachment, and leave the crop in bunches or shocks in the field. Most found little difficulty in the crop coiling or hanging together during or after cutting except where the growth was exceptionally rank. Small to medium size bunches permitting loading in one forkful, minimizing loss from shattering, were preferred. The majority use tight bottom racks covered with canvas or building paper to catch seed shattering in hauling and hulling, when shattering was most common. Most of the growers threshed from the field and with the clover huller, and only 10 per cent had ever rethreshed. Slightly more than half cultivated their alfalfa fields, especially in the spring. The majority used a spring tooth drag.

**A yield analysis of three varieties of barley,** O. T. Bonnett and C. M. Woodworth (*Jour. Amer. Soc. Agron., 23 (1931), No. 4, pp. 311–327, figs. 6*).—The components of the character seed yield were studied at the Illinois Experiment Station in three varieties of barley by taking plants from 50 1-ft. sections of drill row located at random from each of two plats of a variety. Stands within the sampled sections ranged from 2 to 27 plants per foot, the variation probably being due primarily to the unequal distribution of seed by the drill besides other causes affecting seedling survival.

Velvet barley yielded 46.08 bu. per acre, Wisconsin Pedigree 45.52, and Spartan 42.85 bu., and the order was the same for total number of plants. The respective averages were for heads per plant 1.19, 1.3, and 2.34, and for yield of grain per head 0.89, 0.99, and 0.57 gm.

The significant varietal difference in average head production per plant was considered inherent. Variation in soil fertility probably was not a serious factor. and differences in size of seed and thickness of stand had only slight effect. The yield per unit area was associated more closely with number of heads than with number of plants per unit area. The average yield per plant depended upon the average number of heads per plant and the average weight of grain per head. The average weight of grain per head varied with the variety, number of heads per plant, class of tiller, and average kernel weight. Spartan, while superior to the other barleys in average yield per plant, had a smaller yield rate because of a smaller total number of plants, and likewise Wisconsin Pedigree yielded less than Velvet. The analysis seemed to show that if sown at the same rate (pounds per acre) a small-seeded variety may outyield a large-seeded variety on account of the larger number of plants per unit area rather than because of superior plant-yield characters.

**Natural crossing in barley at Fort Collins, Colorado, D. W. Robertson and G. W. Deming** (*Jour. Amer. Soc. Agron., 23 (1931), No. 5, pp. 402–406*).—Commercial varieties of barley studied at the Colorado Experiment Station showed very few natural crosses, about 1 hybrid plant being found in every 10,000 in Trebi, 2 in every 10,000 in Colsess, and only 1 in about 37,300 plants of Blackhull studied. Natural crosses varied in number with the variety. *Hordeum deficiens nudideficiens* showed 3.265 per cent in 1927, 20.708 per cent in 1928, and 5.65 per cent in 1929, whereas other varieties tested showed less than 0.15 per cent. The difference between varieties exceeded the difference between seasons.

**The production of an economic strain of white barbless barley, B. D. Leith and R. G. Shands** (*Jour. Amer. Soc. Agron., 23 (1931), No. 5, pp. 396–401*).—Methods used at the Wisconsin Experiment Station in the production of a pure line selection of white barbless barley from a cross between a black smooth type and Pedigree Oderbrucker are discussed, with pertinent data and observations. The highest yielding strains mature about 4 days later than the Oderbrucker parent, and the heads are longer and the kernels plumper. In stripe resistance lines isolated ranged from highly resistant to those more susceptible than the susceptible parent, Pedigrees 37 and 38 being very resistant. Pedigree 38, the best strain, proved a high yielder for farmers, and in station tests over 1928–1930 exceeded Oderbrucker in yield by 17 per cent.

**A study of causes contributing to the large variations in yields from year to year of 4F cotton in the Punjab, T. Trought** (*Indian Jour. Agr. Sci., 1 (1931), No. 3, pp. 309–350, pls. 12*).—Factors which might contribute to the low yield of 4F Punjab American cotton in certain seasons are analyzed, and remedial measures are suggested. The effects of climatic and physiological factors are described, and the importance of root development is emphasized. While diseases and pests may play a part, they are consequences of other factors and not initiating factors. In failure years the overlapping effect of a series of adverse factors operating at comparatively short intervals apparently prevents the recovery of the plant before crop maturity, and as a result it fails to produce properly developed lint and seed. The plant seems most susceptible in its early stages when adverse factors are at their maximum. The factors react on root development, reducing it from its optimum. While adoption of good agricultural practice may aid in mitigating the effect of the adverse factors, a type of cotton still more resistant to the prevailing severe climatic conditions appears needed to solve the problem.

**The effect of soil types and fertilizers on yield and quality of fiber flax,** B. B. Robinson and R. L. Cook (*Jour. Amer. Soc. Agron., 23 (1931), No. 7, pp. 497–510; abs. in Michigan Sta. Quart. Bul., 14 (1931), No. 1, p. 54*).—The effect of soil type and fertilizer on the total yields of straw, fiber, and seed of fiber flax, the percentage of fiber in the straw, and the quality of the fiber were studied in tests on four soil types.

The heavier types of soil outyielded the lighter soil consistently, Brookston clay loam, a heavy soil, giving much greater straw and fiber yields for three years than did the medium heavy Hillsdale soil. Fertilizer applied to the lighter soils did not make them yield equal to the untreated heavier soils. When nitrogen was added to combinations of phosphorus and potassium fertilizers it did not increase fiber yields and enhanced seed yields only slightly. Phosphorus applied with potassium increased yields but not when used alone. Additions of phosphorus often resulted in an increase in length of straw. When used with phosphorus, potassium applications were correlated with increased yields of fiber and seed. Calcium applied one year before the experiments started increased yields only slightly, tended to lower the fiber percentage in the straw, and usually lowered the fiber strength and the hackling percentage, indicating poorer quality. Application of a calcium-magnesium lime usually resulted in increases in the yield of scutched and hackled fiber and the percentage of fiber in threshed straw.

**Studies in crop variation.—VIII, An application of the resistance formula to potato data,** R. J. Kalamkar (*Jour. Agr. Sci. [England], 20 (1930), No. 3, pp. 440–454*).—The eighth number of this series (E. S. R., 65, p. 223) reports a further test of the validity of the resistance formula suggested by Maskell for the yield-nutrient relations of a crop, using as material the results of Rothamsted potato fertilizer experiments of 1929, and confirming the conclusions of B. Balmukand[1] as to the possibility of fitting the formula to experimental data.

**Rice-breeding in the Central Provinces,** D. N. Mahta and B. B. Dave (*Indian Jour. Agr. Sci., 1 (1931), No. 3, pp. 351–371, pls. 13*).—The status of the rice crop in the Central Provinces is reviewed, and the progress made in rice improvement is reported on, with descriptions and illustrations of improved varieties and hybrids.

**Root crops for forage in Michigan,** H. C. Moore and E. J. Wheeler (*Michigan Sta. Spec. Bul. 216 (1931), pp. 18, figs. 12*).—Practical information is provided on varieties (E. S. R., 59, p. 524) of mangels, rutabagas, turnips, and carrots, and comparative yields, and on cultural and field methods and harvesting and storage practices under Michigan conditions. The feeding value of the several classes of roots is commented on, and directions for their use are given.

**Some investigations on the sampling, analysis, and composition of the sugar beet,** G. Milne, H. T. Jones, and J. S. Willcox (*Jour. Soc. Chem. Indus. Trans., 50 (1931), No. 18, pp. 155T–160T, fig. 1*).—Analytical studies with sugar beets, partly in connection with field experiments, were carried on during six seasons by the University of Leeds.

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[1] Jour. Agr. Sci. [England], 18 (1928), No. 4, pp. 602–627.

Except with small crops, it was observed that a sample of sugar beets to be representative should comprise at least 50 roots. The use of a boring tool for obtaining material for pulping from a field sample seemed unreliable. The juice-and-factor method was found to lead to higher results than those obtained by the pulp method. Evidence is given to show that the factory method of sampling a bulk is inaccurate.

Bolters contained about 2 to 3 per cent less sugar and dry matter than did normal roots and were lower in nitrogen and higher in crude fiber. The crowns, which constituted about 13 per cent of the entire root, were much inferior in sugar and richer in nitrogen, fiber, and ash than was the rest of the root. Small beets were definitely richer in sugar and dry matter than larger beets grown under identical conditions. The greening of the upper part of the root due to exposure above the soil did not materially affect the composition. The development of fangs (forked roots) on beets did not affect the sugar content significantly.

**[Reports of the tobacco division for 1927–1929 and 1930]**, N. T NELSON ET AL. (*Canada Expt. Farms, Tobacco Div. Rpts. 1927–1929, pp. 36, fig. 1; 1930, pp. 26, fig. 1*).—Tobacco investigations at Ottawa and at other experimental centers in Canada (E. S. R., 58, p. 135) included variety, fertilizer, cultural, seed bed, and seed production tests, and surveys of diseases and insect pests. The production and commercial movement of, or market for, Canadian tobacco are discussed for the period indicated.

In fertilizer experiments for cigar tobacco begun at the Central Experimental Farm in 1929, sodium nitrate and ammonium sulfate gave satisfactory results as inorganic sources of nitrogen, and urea showed superiority in the production of high-quality cigar leaf. Tankage consistently delayed maturity and gave lower yields and poorer quality than did cottonseed meal and dried blood. High proportions of organic nitrogen also delayed maturity. Urea apparently could replace much of the organic nitrogen commonly used in fertilizer mixtures. Added increments of phosphoric acid promoted early growth and maturity, but no advantage came from applications above 160 lbs. per acre. Treble superphosphate and diammonium phosphate favored early growth and maturity. High quantities of potash delayed maturity, but quality was affected most seriously by reducing the quantity applied in the basal formula. Potassium carbonate caused irregularities in stand during the first month after transplanting. Potassium sulfate consistently produced high quality and yield during the tests. Potassium nitrate enhanced maturity more than did the sulfate and carbonate. A decline in the yield and quality accompanied heavy applications of manure alone, whereas direct benefit was obtained by reducing the manure application to 10 tons per acre and supplementing it with 1 ton of 4–5–5 fertilizer. Commercial fertilizers alone gave the best quality and yield.

The nicotine content of the tobacco plant was found in experiments at Harrow and Ottawa, Ont., and Farnham, Que., to increase with advanced maturity after topping and suckering. The upper leaves with these treatments contained more nicotine than the lower leaves. Nitrogen translocation effects induced by topping and suckering apparently determined the nicontine content of the various leaves on a tobacco plant. Certain varieties normally had a higher nicotine content than other varieties. The nicotine content of the stalk was consistently lower than that in the leaves. It did not appear financially advantageous, with current prices, to grow tobacco entirely for nicotine manufacture even with the high percentages of nicotine obtained with certain varieties.

**Wheat varieties on the high plains of Oklahoma, H. H. Finnell** (*Oklahoma Sta. Bul. 200 (1931), pp. 32*).—Variety tests at the Panhandle Experiment Station at Goodwell during the period 1924–1930 revealed no wheats surpassing in average yield the common varieties of the Turkey group and Blackhull. Minhardi, Burbank, and Fultz made the lower average yields. Production during the period varied from 0 to 55 bu. per acre, there being failures in 1925 and 1927 on both stubble and summer fallowed land and also in 1928 on stubble.

Varieties differed somewhat in response to preparation method. Minturki produced 114 lbs. more net grain per acre in continuous culture than alternating with fallow, whereas Malakof on summer fallow made 55 lbs. per acre more than as continuous wheat. Blackhull consistently produced a higher proportion of grain to straw than any other variety, either on stubble or summer fallow. All sorts made higher proportions of grain to straw on stubble land. Some correlation was apparent between the thickness of stands produced by uniform rates of seeding and the relative winter hardiness of different varieties. As to maturity, the earlier varieties included Blackhull and Superhard Blackhull; Kanred, Turkey, and similar varieties about two days later; and Minturki and Minhardi three or four days later. There was no consistent relation between time of maturity and yield.

The protein content of all varieties averaged 14.15 per cent on stubble and 15.54 per cent on summer fallow. Cultural and seasonal conditions seemed to affect protein content more than varietal differences. While the dockage of recleaned samples differed among varieties, it was influenced most by seasonal and preparatory conditions. Minturki and Malakof, for example, preferring stubble and fallow, respectively, also suffered the least market dockage where their highest yields were made.

**Comparison of the strength of Marquis, Garnet, and Reward grown in Saskatchewan, R. K. Larmour** (*Sci. Agr., 11 (1931), No. 12, pp. 801–819, figs. 15*).—Milling and baking tests made at the University of Saskatchewan on samples of Marquis and Garnet wheat grown on adjacent plats in 1927, 1928, and 1929 showed that in general Garnet was lower in protein and baking quality than the corresponding sample of Marquis. The difference in protein content seemed more pronounced when weather conditions favored high yield and low protein, but the two varieties differed little in average protein when grown under dry conditions. Study of many samples of the 1929 crop on the basis of protein content indicated that in general Marquis and Reward were decidedly superior to Garnet of the same protein content. As to blending value, as shown by the blend-bromate formula (E. S. R., 65, p. 532), Marquis and Reward were nearly equal and both very much superior to Garnet of the same protein content.

**Milling and baking tests with some Indian wheats grown at Pusa and at Mirpurkhas (Sind), F. J. F. Shaw** (*Indian Jour. Agr. Sci., 1 (1931), No. 3, pp. 395–414*).—The results obtained in milling and baking tests described in the appended account (pp. 400–414) by E. A. Fisher entitled A Report on Sixteen Samples of Indian Wheats Grown at Pusa and Sind, 1929–30, are discussed briefly. A new wheat, Pusa 111, discovered as a smooth-glumed mutation in Pusa 4, was found equivalent to good Manitoba wheat in value and with commercial possibilities as a strong wheat. It was of excellent milling quality, offering no difficulties as regards conditioning treatment and seeming distinctly easier to mill than most of the hard wheats. It gave a high yield of flour, which appeared of the hard wheat flour type and had remarkably low ash and high protein contents.

## HORTICULTURE

**Field experiments in horticulture,** T. N. Hoblyn (*Imp. Bur. Fruit Prod. [East Malling, Kent], Tech. Commun. 2 (1931), pp. 50, pls. 3, figs. 6*).—A memorandum is given on the application of statistical methods to the planning of horticultural experiments and the analysis of the resulting data. Among major topics considered are (1) early horticultural experiments and the cause of their failure, (2) the layout of horticultural experiments in the field, and (3) the technic of horticultural experiments, with particular reference to deciduous tree fruits. As examples, the data from three actual trials at the East Malling Research Station are presented with analyses.

**[Horticulture at the Kentucky Station]** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 26, 27, 29, 32, 37, 38*).—Studies in pyrethrum growing showed that acetic acid is effective in controlling weeds and fungi in the seed bed. No injury to germination was apparent from sowing seed on four successive days following the acid treatment. Muslin proved to be the best plant-bed cover. Seed obtained from Switzerland, Japan, France, and Algeria proved valuable in the order given. Cultural procedure is discussed. Three diseases, *Rhizoctonia* sp., *Septoria* sp., and *Alternaria* sp., caused some losses of plants. Flowers gathered when the disk florets were three-fourths to full open contained more pyrethrum than did closed flowers. Drying in shade gave the best results, and artificial drying at 110° F. for 120 hours did not reduce toxicity.

Determinations of arsenic residue on apples showed washing to remove arsenic effectively, whereas with brushing or no treatment the tolerance was exceeded.

The Viking proved to be a desirable forcing tomato, and rotting cornstalks were successfully used for heating the hotbed in which tomatoes were produced. Paper mulch increased the yields of most vegetables except beets and onions.

Strawberries grown at the Western Kentucky Substation on soil into which had been plowed a sweetclover crop did not respond to fertilizer; in fact, yields were cut by fertilizers, due apparently to overvegetativeness. Nitrogen fertilizers proved beneficial to apples and peaches.

**[Horticulture at the Williston Substation],** E. G. Schollander (*North Dakota Sta. Bul. 248 (1931), pp. 35–38, figs. 2*).—Brief comments are presented on the results of varietal tests with vegetables and fruits.

**The use of peat in horticulture,** K. H. Johnstone (*Jour. Min. Agr. [Gt. Brit.], 38 (1931), No. 5, pp. 474–481*).—A summation of the present status of technical knowledge.

**The inter-relations between vegetative propagation and seed reproduction,** A. B. Stout (*9. Internatl. Hort. Cong., London, 1930, Rpt. and Proc., pp. 187–196; Fr., Ger. abs., pp. 187, 188*).—Several types of sterility are said to exist in flowering plants normally propagated asexually. Included among types of special interest are the nonblooming condition, plethoric sterility, intersexualism, especially male sterility, self-sterility, dropping of the flowers, seedlessness of the fruits, and sterility resulting from hybridism or polyploidy. The origin of the different types of sterility is discussed and examples cited. No evidence was found that long continued asexual reproduction in itself led to degeneration either of vegetative vigor or seed reproduction provided the clons were kept free from disease.

**Suberization and wound-periderm formation in sweetpotato and gladiolus as affected by temperature and relative humidity,** E. Artschwager and R. C. Starrett (*Jour. Agr. Research [U. S.], 43 (1931), No. 4, pp. 353–364,* *pl. 1, figs. 7*).—The results are presented of an anatomical study of the structure of the sweetpotato root and of the gladiolus corm, and of the process of suberization and wound periderm formation in each as influenced by temperature and relative humidity of the air in which stored.

In the sweetpotato wound periderm formed readily at temperatures between 22 and 34.8° C. (71.6 and 94.6° F.) provided the relative humidity was sufficiently high. At lower temperatures the process was retarded and eventually inhibited; at higher temperatures the danger of decay was increased. Much the same relations held with gladiolus, the cork cambium appearing most rapidly at 30.9° C. (87.6° F.). Wound cork in both species appeared to belong to the common or initial type, although occasionally parenchyma cells were found in the gladiolus containing a number of periclinal divisions suggestive of the "etagen" cork of the monocotyledons.

**Variation in the Lima bean, Phaseolus lunatus L., as illustrated by its synonymy,** G. P. Van Eseltine (*New York State Sta. Tech. Bul. 182 (1931), pp. 24, pl. 1, figs. 3*).—The results are presented of a study of type specimens available in European herbaria combined with a study of general herbarium material in a number of European and American collections and of numerous forms grown in field trials. The Lima bean was, like many other cultivated plants, found rather variable, but it is believed that these variations are better defined as relative differences of measurement, color, texture, etc., than as absolute taxonomic distinctions, since the characters used often varied on the same plants and it was apparently difficult to retain horticultural varieties true to type in field trials. The conclusion is reached that it is advisable to hold all forms of the Lima bean under the single specific name *P. lunatus* and to leave the other variants to be named by the horticulturist.

**Hydrogen-ion concentration in relation to the growth of onions,** A. L. Wilson (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 524–528; abs. in Utah Sta. Circ. 95 (1931), pp. 13, 14*).—An analysis of records taken on onions grown in a nutrient solution adjusted at 0.5 intervals over a pH range of 3.5 to 8 under three environments as respects the temperature and the intensity and duration of light indicated that growth occurs equally well over a rather wide range, 5.5 to 7, and is little affected by environmental factors.

**Morphological development of sweet corn pericarp in two inbred lines and their $F_1$ hybrid,** E. S. Haddad (*Indiana Sta. Bul. 347 (1931), pp. 24, figs. 14*).—Seeking to determine the causes of toughness of the pericarp of sweet corn, cytological studies were made of kernels collected at 5-day intervals from three strains of Narrow Grain Evergreen, one being the $F_1$ hybrid between the other two. The thickness of the ovary wall at the 1-day stage varied among the three strains, the hybrid having the thickest wall. The ovary wall of the two parental strains increased in thickness until the 15-day stage and that of the hybrid until the tenth day. Because of the thinner ovary walls in the hybrid at all stages between that of maximum thickness and maturity and because of the fact that the puncture test showed the thinner pericarps to be more resistant, the author concludes that the hybrid reached maturity earlier than either parent.

The ovule of sweet corn of the variety studied possessed two integuments, with the number of layers of cells in the outer and inner integument the same in both the inbred and the hybrid lines. The inner integument was thicker than the outer. Resorption took place first in the outer integument, followed by the inner integument, the epidermis of the nucellus, and the inner half of the ovary wall.

**Varieties of tree fruits for Iowa planting,** H. L. LANTZ (*Iowa Sta. Circ. 131 (1931), pp. 48, figs. 14*).—Prepared in four parts, one each devoted to the apple, pear, plum, and cherry, this circular presents information on varieties and their hardiness and adaptability to Iowa conditions. Included are the named varieties originated by the station.

**Orchard management** (*New York State Sta. Circ. 121 (1931), pp. 21*).—A presentation of practical information on fundamentals, based on the results of scientific investigation and on successful practice.

**Mice, trees, and freezes,** F. C. BRADFORD (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 30, 31*).—Grass growing close to the base of the tree retards ripening of the bark tissues at this point but also functions favorably as protection against winter injury. If grass is to be removed for mouse protection, the author advises that it be taken out in early autumn, so as to allow time for the exposed tissues to harden. Sandy loam banked in late fall about the base to a height of 6 in. satisfactorily replaces the grass and adds mouse protection.

**Raising root stocks from seed in the United States,** G. E. YERKES (*9. Internatl. Hort. Cong., London, 1930, Rpt. and Proc., pp. 83–91; Fr., Ger. abs., pp. 83, 84*).—A general discussion presenting details concerning the distribution of the industry, sources of seed, and cultural practices, supplemented by data on the first season's growth of apple seedlings grown at Arlington Farm, Virginia, from open-pollinated seed of named varieties, including 8 French crabs. Wide variations were found in the weight of seedlings from different parents, ranging from a minimum of 4.9±0.22 gm. for Paragon seedlings to 22.5±0.47 gm. for Ben Davis. The percentage of straight roots also differed greatly, from a minimum of 52 per cent in York Imperial seedlings to 95 per cent in Ralls progenies.

**The propagation of apples by means of root cuttings,** W. H. UPSHALL (*Sci. Agr., 12 (1931), No. 1, pp. 1–30, figs. 14*).—In these studies, conducted in part at the University of Maryland and part at the Ontario Horticultural Experiment Station, very poor results were secured from root cuttings taken from mature trees while excellent results were attained with cuttings from 1-year-old seedlings; thus checking the results reported by Yerkes (E. S. R., 51, p. 344). Root pieces failed to exhibit any rest period, a fact observed for attached roots by Harris (E. S. R., 55, p. 643). Root grafts made with French crab understocks made much more growth than those with variety roots. French crab roots grafted on variety roots greatly increased the latter's capacity to form new roots, the French crab apparently supplying from above some nutrient or nutrients concerned in rooting.

Carbohydrate and enzyme studies made upon samples of the various roots showed the easy rooting class to be slightly higher in carbohydrates and to exhibit greater activity of the enzymes amylase and catalase. There were no consistent differences in the rate of respiration between the easy and the difficult rooting pieces. The only consistent anatomical difference was in a greater abundance of wood and pericyclic fibers in the difficult class. Gum formed rapidly in the vessels of all root pieces and quickly barred the passage of water through them. Gum formation appeared sooner and in greater abundance in the difficult rooting group. No treatment was discovered that was capable of preventing gum formation, although waxing the cut ends had a retarding influence.

Relative to substances that might favor rooting, sugar in solution gave the most promising results although considerable difficulty was met in keeping sugar solutions sterile. A pretreatment of the roots in Semesan largely overcame this difficulty. Cuttings fully immersed did not take in sugar, but when placed upright with only the bases submerged considerable sugar was absorbed. In this case transpiration from the cut end is deemed a factor in sugar intake.

**Studies on the time of the fruit bud formation and development of apples in Manchuria** [trans. title], R. WATANABE and T. YASAKA (*Research Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 1 (1930), pp. 1–30, pls. 12; Eng. abs., pp. 25, 26*).—Studies of Red Astrachan, Summer Pearmain, Jonathan, Ben Davis, Ralls Janet, and Tetofski apple buds harvested at various stages of development showed that differentiation of the flower bud becomes visible between June 25 and July 10. The primordia of the floral organs and bract appeared from the middle to the end of July. The difference between early and late varieties did not exceed 2 weeks. Finding no early stages of differentiation in the end of July collections, the authors conclude that differentiation does not continue until frost as has been suggested by other workers. Since differentiation occurred under conditions of maximum temperature, low precipitation, and abundant sunlight, the suggestion is made that these are contributing factors. Shoot elongation started rapidly, slowed down about the time of flower bud formation, and then made a second spurt. Shoot diameter, on the other hand, gained decidedly during the period of differentiation.

**Bud variation in Bartlett pear trees**, A. D. SHAMEL, C. S. POMEROY, and F. N. HARMON (*Jour. Heredity, 22 (1931), No. 3, pp. 81–89, figs. 3*).—Individual tree records taken in a Bartlett pear orchard showed wide differences in production. Propagations from unproductive and productive trees had not yet fruited sufficiently to allow conclusions. A survey of several orchards in different parts of California revealed a considerable number of striking limb sports which are described. Some of the distinguishing features were shape, corrugations, russeting, and size. Propagations from these off types have begun to fruit, and, though too early to draw final conclusions, the young trees to date have borne fruit characteristic of the parental limb.

**Fruits and fruitculture in the Dutch East Indies**, J. J. OCHSE and R. C. BAKHUIZEN VAN DEN BRINK (*Batavia: G. Kolff & Co., 1931, Eng. ed., pp. XV+180, pls. 57*).—Accompanied by colored plates, descriptions and notes are given upon the more valuable fruits utilized in the area covered.

**Results of strawberry fertilizer and tillage experiments: A preliminary report of the Strawberry Soil Fertility and Fertilizer Field Station, Chadbourn, North Carolina, for the seasons 1929–30 and 1930–31**, R. A. LINEBERRY, J. J. SKINNER, H. B. MANN, and C. B. WILLIAMS (*North Carolina Sta. Agron. Inform. Circ. 64 (1931), pp. [1]+15*).—This is a mimeographed report presenting the results of trials conducted cooperatively by the station and the U. S. Department of Agriculture at Chadburn, N. C.

A fertilizer mixture containing 6 per cent ammonia, 8 per cent phosphoric acid, and 6 per cent potash gave the best results, as measured in both yield and quality. Nitrogen equivalent to more than 6 per cent ammonia tended to soften the berries. No marked difference was noted between potassium sulfate, potassium chloride, and kainite as sources of potash, but in some cases kainite seemed to reduce keeping quality. Nitrogen derived partly from inorganic and partly from organic sources gave the best results. Concentrated materials containing readily available nitrogen proved promising, especially as related to influence on vigor. Manganese sulfate was beneficial in some tests and had no effect in others. With the Klondyke variety one application in late summer or early fall gave better results than did split applications. A pH range of from 5.8 to 6.5 was found most desirable for the strawberry on the soils utilized, with some indication that ammonium sulfate was more favorable for strawberries on neutral or slightly acid soils and sodium nitrate for plants on very acid soils.

**The quality of strawberries as influenced by rainfall, soil moisture, and fertilizer treatments,** W. D. Kimbrough (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 184–186*).—The stage of maturity exerted considerably greater effects on the composition of berries than did differences in fertilizer treatment. In the dry season of 1930 irrigation materially influenced moisture and sugar contents of strawberries, the berries from watered plants maintaining their constituents at a constant level throughout the season while those from nonwatered plants showed a decrease in water and an increase in sugars. The seasonal changes in any one plat were more marked than differences due to fertilizer treatment. Berries from watered plants were larger and softer according to the pressure test.

**Influence of winter application of fertilizer to strawberries,** R. W. Taylor (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 187–189, pl. 1*).—Asserting that in Alabama winter applications of fertilizer are highly beneficial in increasing yields not only by increasing the size of the berries and the percentage of set but also by actually increasing the number of blooms, the author cites the results of a fertilizer experiment at Atmore. Here the average percentage increase in number of blossoms on the winter fertilized plants was on March 24 70 per cent above that of the autumn fertilized.

**Materials for breeding grapes on the southern coast of the Crimea** [trans. title], N. V. Paponov (*Zap. Gosud. Nikitsk. Opytn. Bot. Sada (Jour. Govt. Bot. Gard., Nikita, Yalta, Crimea), 16 (1931), No. 1, pp. 51, figs. 14; Eng. abs., pp. 49, 50*).—Observations on several varieties of vinifera grapes showed the occurrence of strains differing markedly in their morphological and biological characteristics. Positive correlations were established between productivity and leaf area, between productivity and length of shoots, and between production and number of shoots. Negative correlation was found for production and total sugar content of the must and between total sugar and total acidity of the must. Production and length of shoots removed at pruning were positively correlated, while between compactness of clusters and length of prunings there was negative relationship.

**Find promising grape variety for local markets,** N. L. Partridge (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 33–35, figs. 2*).—Campbell Early grapes in pruning plats yielded an average of 4.5, 2.7, 5.7, 5.3, and 5.6 tons per acre in 1926, 1927, 1928, 1929, and 1930, respectively. This large production coupled with fine appearance and good quality of the black fruits led to the recommendation that this variety deserves greater consideration by growers located on fertile soils. The vines require heavier pruning than does Concord and the larger the cane the larger the yield, whereas in Concord the best canes were those about 0.25 in. in diameter.

**Cacao propagation: The vegetative propagation of Theobroma cacao by softwood cuttings,** E. E. Pyke (*Trop. Agr. [Trinidad], 8 (1931), No. 9, p. 249, pl. 1*).—Although cacao cuttings were successfully rooted in a solar frame, considerable difficulty was observed in their development of top growth; in fact, several succumbed without making any new leaves. The first stage in the formation of roots was the development of callus by the cambium of the cut end. This activity gave rise to a funnel shaped ring of tissue, known as the Lohden wedge, in which arose the new root primordia starting as small spherical tumors of growing cells. The association of adventitious roots with medullary rays appeared obligatory.

**Aster seed treatment,** W. O. Gloyer (*New York State Sta. Circ. 122 (1931), pp. 6, figs. 2*).—A popular account based on the results of investigations recently reported (E. S. R., 65, p. 741). Practical suggestions for the growing of asters are included.

**Yield and quality of roses and carnations as affected by position on the bench, F. F. Weinard and S. W. Decker** (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 454–456*).—Individual plant records taken in houses of roses and of carnations at the University of Illinois showed distinct influences of the position in the house on yields. Neither stem length of roses nor the quality of the blooms were significantly influenced.

**Influence of amount of foliage on rooting of coleus cuttings, V. C. Calma and H. W. Richey** (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 457–462, pls. 2, figs. 4*).—Experiments at the Iowa State College with coleus cuttings selected for uniformity but leaf pruned in different degrees indicated that under suitable growing conditions the rate and amount of root growth is directly related to the leaf area left on the cutting. The ability of coleus to develop a root system rapidly is deemed to account for its resistance to the evil effects of wilting. Apparently the larger leaf area increased the photosynthetic capacity and incidentally the food reserves of the cuttings. Cuttings defoliated on one side produced roots largely on the nondefoliated side. Mortality was high in the fully defoliated cuttings.

**Peonies in the garden, C. H. Connors** (*New Jersey Stas. Circ. 250 (1931), pp. 8, fig. 1*).—A revision of Circular 184 (E. S. R., 55, p. 142) to which has been added information on diseases by R. P. White.

**Rose under-stocks in a five-year test, G. E. Yerkes** (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 463–466*).—Studies at Arlington Farm, Virginia, of the growth and flowering of seven varieties of garden roses each grown on 14 different rootstocks including own roots showed very distinctly that certain stocks are decidedly superior to own roots, which, in fact, yielded the least number of blossoms over a 5-year period. A seedling population of *Rosa multiflora* Chenault No. 5892 gave the best results both in flowers and growth, yielding almost double the number of blossoms that were obtained from own rooted plants.

**The relation of the growth of plants and the H-ion concentration of rose soils, P. W. Zimmerman, W. Crocker, and A. E. Hitchcock** (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 449–452*).—Determinations of the reaction of soil used for rose growing in various commercial houses and institutions showed a wide range of pH values, 4.7 to 7.2. In general, the best roses were grown between pH 5 and 6.5. Data for the several houses are presented.

**Experiments with solutions of chlorine and sodium chloride on pot plants, P. R. Krone and F. F. Weinard** (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 444–448*).—Observations and measurements of the growth of celosia, gaillardia, penstemon, petunia, phlox, verbena, and zinnia seedlings watered with chlorinated water and salt water showed distinct injury from chlorinated water in concentrations greater than 5 parts per million, and even in this lot the average height and weight was less than that of the cistern watered plants. Where plants were injured, both the root and the top suffered. Zinnia roots in the cistern watered lot weighed 5.6 gm. as compared with 3.6 gm. in the 100 parts per million lot and 1.5 gm. in the 1,000 parts per million group. In the case of common salt a solution of 100 parts per million caused no injury in 1 month, while slight burning of zinnias was noted in the 200 parts per million group. Gaillardias and petunias were least injured with all concentrations. A mixture of sodium chloride and sodium sulfate was less harmful than either substance alone.

**Sterility in garden flowers, E. Böhnert** (*Untersuchungen über Selbststerilität und Selbstfertilität bei Gärtnerischen Kulturpflanzen. Diss., Landw. Hochsch., Berlin, 1929, pp. [1]+47, figs. 26*).—Pollination tests with a large number of greenhouse and garden flowers showed that self-fertility is much more common in this group than is self-sterility. Of a total of approximately 75 plants only 15 were completely self-sterile. Included in this sterile group were Abutilon, Campanula, *Cereus speciosus*, California poppy, flowering tobacco, and *Primula malacoides*.

On the other hand self-pollination led almost without exception to decreased vigor manifested in several ways, (1) a lesser number of ovules developing into viable seed, (2) a longer period between sowing and germination, (3) greater susceptibility of resulting plants to seedling diseases, and (4) less vigorous growth. A correlation was established between seed weight and viability.

**The preservation of cut flowers** [trans. title], Z. Arnold (*Gartenbauwissenschaft, 5 (1931), No. 4, pp. 255–266*).—The placing of Nigella, sweet pea, snapdragon, gaillardia, petunia, and chrysanthemum blooms in a 5 per cent glucose or 5 per cent sugar solution prolonged their life appreciably, whereas dilute aspirin reduced keeping in some instances. Common salt was generally harmful, while magnesium sulfate solution was of no significance in either direction. The glucose and sugar solutions more or less reduced transpiration, varying with the flower under test. Aspirin, magnesium sulfate, and salt increased transpiration in some cases and lowered it in others. The lowering of transpiration by the sugar solutions paralleled the longer life in the cut blooms.

**Hardy shrubs for the Panhandle landscape**, F. P. Eshbaugh (*[Oklahoma] Panhandle Sta., Panhandle Bul. 31 (1931), pp. 10–15, fig. 1*).—Briefly discussing the climatic conditions which obtain in the region, the author lists ornamental plants which have been grown at the station, with data as to their hardiness, adaptability, etc.

**The ornamental trees of South Dakota**, N. E. Hansen (*South Dakota Sta. Bul. 260 (1931), pp. 63, figs. 8*).—Grouped alphabetically according to botanical names, descriptions and notes are presented on a large number of ornamental trees, many of them also fruit bearers.

**Hedges and their uses**, W. T. Macoun (*Canada Dept. Agr. Bul. 142, n. ser. (1931), pp. 44, figs. 27*).—Notes are presented on trees and shrubs tested for hedge purposes at the Central Experimental Farm, Ottawa, and at the branch stations.

## FORESTRY

**Forest management**, H. H. Chapman (*Albany, N. Y.: J. B. Lyon Co., 1931, pp. 544, figs. 26*).—A comprehensive discussion.

**Revegetation after logging and burning in the Douglas fir region of western Washington**, R. Kienholz (*Ill. State Acad. Sci. Trans., 21 (1928), pp. 94–108, figs. 5*).—Observations on the vegetation on 80 plats located on 7 different areas representing 6 different dates of burning showed the density of the vegetation to be associated directly with the length of the period elapsing since burning. Severely burned areas showed less vegetation than did moderately burned. Herbaceous species present in the original stand were most abundant on areas recently burned. Shrubby species present in the original stand started less rapidly and became more abundant as the elapsed period increased. Weeds started slowly but very rapidly attained a dominant position in the older plats. No consistent differences in amount of vegetation were noted between north and south slopes, between gentle and steep slopes, or between clay and gravel soils. The vegetation following fires is deemed to be in an unstable condition, with rarely any one species completely dominant.

**The relation of forest composition and rate of growth to certain soil characters**, H. W. Hicock, M. F. Morgan, H. J. Lutz, H. Bull, and H. A. Lunt

(*Connecticut State Sta. Bul. 330 (1931), pp. 671–750, figs. 19*).—The first portion of this paper, entitled A Study of Soil Type as a Factor in Determining the Composition of Natural, Unmanaged Mixed Hardwood Stands, presents the results of studies in four tracts aggregating 210 acres. On four representative areas of 40-odd acres each there were found 10 distinct soil types, with no less than four on any one area. Red maple, black birch, white oak, red oak, yellow birch, white ash, hickories, hard maple, black oak, and chestnut oak comprised 65 per cent of the tree population. Attempts to correlate tree species with any specific soil type were largely unsuccessful. It is believed that two or possibly more soil types may be biologically equivalent, and that climatic conditions are so generally favorable as to mask the results of soil variation. In addition, fire and certain disturbances caused by man upset the balance of nature.

Soil moisture differences had more effect on the flora than did soil type. For example, elm and black ash were almost entirely absent from well-drained soils. In the same way lesser vegetation varied with soil moisture. Mesophytes, such as *Alnus incana* and Asplenium, occurred on poorly drained areas and xerophytes, such as huckleberry and hazel, on the dry soils.

The second part, entitled The Relation of Soil Factors to the Growth of Red Pine in Plantations, deals with the results of red pine measurements and of soil analyses made on samples taken from 200-odd locations which included all the important soil groups occurring in Connecticut. Soil series, soil texture, and character of the duff and of the subsoil considered separately were correlated to a certain extent with site index. No relation was established between H-ion concentration of any soil horizon and site index. The total nitrogen content of the upper mineral soil layer showed more correlation with site index than any other factor analyzed. The moisture equivalent of the upper zone also exhibited a fairly high correlation with site index. Colloidal content of the upper zone showed practically no correlation. Except where total nitrogen was significantly low, it appeared that the stands under study obtained adequate amounts of available nitrogen. In most cases very little nitrate was produced, and ammonia appeared to be the chief source of nitrogen.

Correlations of various soil factors with site index as expressed in height increment of the dominant trees was not fully successful, a result thought due to the generally favorable growth conditions which masked the effect of any single factor. Poor sites were those in which the soil was coarse textured in all horizons and low in moisture holding capacity, in total nitrogen content, and in the rate of nitrogen transformation in the upper layers. The best soil for red pine was that possessing opposite characteristics to the aforementioned. Summing up, the authors assert that Connecticut soils in general may be classed as good to excellent for red pine.

**Diameter distribution series in even-aged forest stands,** W. H. MEYER (*Yale Univ. School Forestry Bul. 28 (1930), pp. 105, figs. 16*).—Stating that distribution series of the sizes of trees in even aged stands may be analyzed either graphically or mathematically, the author presents the results of a study of two methods of mathematical analysis, namely, Charlier Type A and Charlier Type B, as applied to diameter data on several coniferous species, Douglas fir, red spruce, balsam fir, white pine, slash pine, shortleaf pine, southern white cedar, and western yellow pine. Both of the Charlier types were found satisfactory, with Type B deemed more desirable for stands of small average diameter in which there is a decided truncation of the diameter scale at the lower end. When the average diameter rises to a value for which the distribution is not exceedingly warped, Type A is deemed preferable. Mathematical methods of defining distribution series are said to have an advantage over any other method, because they represent more accurately actual conditions.

**Trenched plots under forest canopies**, J. W. TOUMEY and R. KIENHOLZ (*Yale Univ. School Forestry Bul. 30 (1931), pp. 31, pls. 11, figs. 3*).—Observations on soil moisture, ground cover, and tree growth on trenched plats established in 1922 under a mature stand of white pine located in the Yale Forest near Keene, N. H., led to the general conclusion that soil moisture is a potent factor in determining the growth under canopies. During the driest months of the year, soil moisture was from two to nine times as great in the trenched as in the untrenched plats and never fell below the wilting coefficient in the trenched areas. In the year following trenching there was a great increase in the amount of vegetation on the trenched plats, a change accentuated as the years progressed both in respect to number of species and the luxuriance of growth. On the untrenched plats there was little change in size or number of individuals during the same period. The density of the vegetation on the trenched area was 80 per cent as compared with 8.1 per cent on the untrenched. Hemlock on the trenched plat averaged 37.7 in. in height but on the untrenched area only 2.5 in. Hemlock grew better on the trenched plats than did white pine, the conditions apparently better suiting the hemlock.

The soil on the plats was a fine to coarse sand, slightly acid in nature, and with a relatively low content of organic matter. Chemical light intensity 3 ft. above the soil was 7 per cent of full sunlight. The plats were retrenched at 2-year intervals to destroy encroaching roots.

**Southern white cedar**, C. F. KORSTIAN and W. D. BRUSH (*U. S. Dept. Agr., Tech. Bul. 251 (1931), pp. 76, pls. 4, figs. 19*).—This paper is presented in two parts, the first of which by Korstian is entitled Characteristics, Growth, and Management of the Forests and deals with the distribution and occurrence of the species, description of the tree, growth requirements, susceptibility to injury from disease, insects, fire, etc., methods of reproduction, associated species, yields, silvicultural management, returns, and similar material.

The second part by Brush, entitled Economic Importance, Physical Characteristics, and Utilization of the Wood, discusses the uses of white cedar wood, estimated annual cut, structure and properties, and similar matters. Yield, volume, and taper tables are appended.

**Shortleaf pine**, W. R. MATTOON (*U. S. Dept. Agr., Farmers' Bul. 1671 (1931), pp. II+44, figs. 29*).—This is a revision of Farmers' Bulletin 1534 (E. S. R., 58, p. 440), and presents in a like manner general information upon growth rates, measurement of standing timber and logs, production per acre, thinning operations, cutting, marketing, replanting, and the protection of the growing crop.

**The cypresses**, W. DALLIMORE (*Empire Forestry Jour. [London], 10 (1931), No. 1, pp. 37–47*).—The various species of cypress are classified and briefly described.

**The evergreen forests of Liberia**, G. P. COOPER and S. J. RECORD (*Yale Univ. School Forestry Bul. 31 (1931), pp. XI+153, pls. 16*).—Descriptions are given of the tree and wood of a large number of West African species, and the results are presented of timber tests on 104 specimens.

**The mechanical properties of wood**, G. A. GARRATT (*New York: John Wiley & Sons; London: Chapman & Hall, 1931, pp. IX+276, pl. 1, figs. 66*).—This book deals with the mechanical properties of wood and the factors affecting them, working stresses for structural timbers, and methods of timber testing. It includes also a nomenclature of American woods and gives information on structural grades of American lumber standards. A sample working plan for tests on small clear specimens of wood is also outlined.

**A new method for determining the proportion of the length of a tracheid that is in contact with rays**, A. J. STAMM (*Bot. Gaz., 92 (1931), No. 1, pp. 101–107, fig. 1*).—At the U. S. D. A. Forest Products Laboratory a simple method based on a count of structural elements was devised for determining the ratio between the length of the tracheid ray to total tracheid wall contact. Data presented for a large number of softwoods show a range from 0.072 to 0.288. Values for a given species varied less, and for different parts of the same specimen still less. No significant difference was found between the values for summer wood and for spring wood.

## DISEASES OF PLANTS

**[Plant pathology at the Kentucky Station]** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 21–24*).—Tobacco mosaic was largely controlled by eliminating the use of unsterilized chewing tobacco by the laborers employed in handling the plants. A gradual but slow increase in mosaic was observed during the summer. Little if any spread was observed following the cutting of the suckers.

A white and a green cucumber mosaic were collected, and both produced more or less ringlike green patterns on tobacco. Two strains of white cucumber mosaic, after passage through the cucumbers, each produced streak on the tomato differing somewhat from the usual streak in that the diseased areas were light brown rather than black.

The inoculation of beans with all the virus diseases of tobacco showed that the viruses grouped with the true tobacco mosaic produced small necrotic spots on the leaves, whereas ring spot, the only virus to produce infection, yielded large necrotic areas or ringlike necrotic and chlorotic patterns. It is suggested that the bean should serve in identifying viruses of the true tobacco mosaic group.

A virus transferred from *Plantago major* to tobacco produced symptoms differing from those of other tobacco viruses studied but similar to that obtained from naturally infected tobacco. Inoculations from various solanaceous weeds to tobacco resulted generally in typical tobacco mosaic, but in three plants produced mosaics containing a mixture of tobacco mosaic and vein banding.

A virus transferred by budding from Japanese plums to the peach produced prominent chlorotic line and ring patterns similar to the ring spot of tobacco. Occasionally patterns were found in the leaves of the affected plums.

Frenching of Turkish tobacco grown in soil in the greenhouse was found related to nutrient deficiencies and the lime supply. Below pH 6 frenching did not appear, irrespective of nutrition. Above pH 6 frenching did occur in the presence of certain nutrient deficiencies, such as inadequate nitrogen, phosphorus, or potash. Frenching could not be produced in tobacco grown in the usual sand and water cultures, but was produced in one sand culture where a large amount of high-grade pulverized limestone was used. Frenching of tobacco in the field was nearly always associated with phosphorus or potash deficiency when it occurred early in the life of the plant, but when caused by nitrogen deficiency it appeared only in the later life of the plant. Extensive deadening of the leaf tissues was observed in Turkish tobacco grown in water, sand, or soil with a pronounced lack of phosphorus.

Further crosses were made in order to increase the resistance of Burley tobacco to black root rot. Isolations of *Thielaviopsis basicola* from various sources, and indeed from the same source, varied markedly in morphological characters, but it was not determined whether such differences were permanent. Acetic acid treatment of tobacco beds did not give promising results.

**Indiana plant diseases, 1926 and 1927,** M. W. Gardner (*Ind. Acad. Sci. Proc., 43 (1927), pp. 411–426, figs. 9; 44 (1928), pp. 143–157, figs. 5*).—In these, the eighth and ninth of the series (E. S. R., 63, p. 44), diseases enumerated as of outstanding importance include for 1926 apple fire blight and bitter rot; bean mosaic and bacterial blight; cantaloupe mosaic and bacterial wilt; clover mosaic; corn root, stalk, and ear rots; pea Fusarium wilt and bacterial spot; peach leaf curl, bacterial spot, and brown rot; potato virus diseases; sweetpotato black rot and Fusarium stem rot; tomato bacterial spot, early blight, mosaic and streak, and buckeye rot; wheat leaf rust; and maple wilt.

Diseases or parasitic organisms not previously reported for the State in these Proceedings include maple Verticillium wilt, pea Fusarium wilt, pear rot (*Phytophthora cactorum*), white pine snow mold (*Scorias spongiosa*), pumpkin diseases (*Peronoplasmopara cubensis* and *Erysiphe cichoracearum*), rape black rot (*Bacterium campestre*), sorghum and Sudan grass diseases (*B. holci*), soybean brown spot (*Septoria glycines*), vetch leaf spot, and zinnia leaf spot (*Cercospora atricincta*). Notes of interest deal with vascular penetration of apple fruit tissue by fire blight bacteria in inoculation tests, varietal susceptibility of apples to fire blight, seed transmission of cowpea mosaic by the Progressive White variety, the seedling peach tree as a brown rot menace, occurrence of *Phytophthora infestans* in potato tubers, renewed prevalence of tomato bacterial spot and buckeye rot of green tomato fruits, and sulfur dust injury to tomatoes.

The diseases reported as of outstanding importance for the year 1928 include apple scab and blotch, celery Septoria blight, cherry leaf spot, clover anthracnose, currant and gooseberry anthracnose, crown rust of oats, onion neck rots, peach bacterial spot and brown rot, raspberry anthracnose, sweetpotato black rot, tomato Septoria leaf spot and early blight, wheat leaf rust and bunt, sycamore and oak anthracnose, and Phytophthora blight of peonies.

Diseases or parasitic organisms not previously reported for Indiana in this series include alfalfa stem blight (*Pseudomonas medicaginis*); *Nectria cinnabarina* on apricot; bean angular leaf spot (*Isariopsis griseola*); *Alternaria brassicae* on Brussels sprouts; leaf spot on Chinese cabbage (*A. herculea*); bacterial spot of carnation; coneflower mosaic; corn foot rot (*Ophiobolus heterostrophus*); bacterial spot of delphinium; gladiolus corm rot (*Penicillium gladioli*); *Bacterium puerariae* on kudzu vine; onion mycelial neck rot (*Botrytis byssoidea*); small sclerotial neck rot (*B. squamosa*); Fusarium pink stain; pear brown bark spot or measles; sorghum rust (*Puccinia purpurea*); Thielavia root rot of sweet peas; tomato stem rot (*Sclerotium rolfsii*); and gray leaf spot of turnip (*A. herculea*). Further observations include the occurrence of Phytophthora rot on young green apples, a fall outbreak of apple pink rot in Grimes probably following surface bitter pit, *I. griseola* on bean pods, resistance of London Market currant to anthracnose, sunscald of onions, resistance of Plum Farmer black raspberry to anthracnose, importation of tomato Septoria on southern grown plants, and Septoria lesions on tomato fruit.

**Phytophthora parasitica Dast. causing "damping off" disease of cotton seedlings and "fruit-rot" of guava in India,** M. MITRA (*Brit. Mycol. Soc. Trans., 14 (1929), pt. 3-4, pp. 249-254, figs. 2*).—A brief description is given of a cotton seedling spotting disease appearing in 1926, which proved to be the first occurrence of cotton Phytophthora disease (*P. parasitica*) in India.

Every year during the wet period (July to September) a fruit disease appears on guava near Pusa resembling the "cottony leak" of various cucurbits caused by *Pythium aphanidermatum*, which penetrates and rots the fruit. Comparative studies showed these supposedly different disease organisms to be identical with each other, also with a culture of *Phytophthora parasitica* as reported to have been isolated from castor oil seedlings by Dastur in 1913 (E. S. R., 29, p. 548). Confirmatory identification was accomplished by means of a series of cross inoculations, the results of which are tabulated with a review of the records of *Phytophthora* spp. on cotton and on guava.

**On Rhizoctonia bataticola (Taub.) Butler as a cause of root disease in the Tropics,** W. Small (*Brit. Mycol. Soc. Trans.*, *13* (*1928*), *pt. 1–2*, *pp. 40–68*, *pls. 2*).—To accounts previously noted (E. S. R., 56, p. 752; 57, p. 745; 59, p. 636), the author adds later observations. He considers that the true significance of *R. bataticola* in tropical agriculture will be shown by investigations conducted in as many regions as possible.

**A leaf-spot of Arctostaphylos manzanita,** A. K. Briant and E. B. Martyn (*Brit. Mycol. Soc. Trans.*, *14* (*1929*), *pt. 3–4*, *pp. 221–225*, *figs. 2*).—A disfiguring leaf spot of *A. manzanita* is described as having become noticeable within two or three months after the setting of apparently healthy cuttings sent to the Botany School at Cambridge in 1927. It appeared that the brown spots were due to cork formation associated with a fungus occurring principally on the upper leaf surface, and apparently due to the presence of a Macrosporium.

The fungal hyphae did not penetrate the epidermal walls, though the palisade cells below were stimulated to form a layer of suberized tissue. The fungus in culture gave rise to perithecia of *Pleospora herbarum*, and the conidia were classed, in view of recent work, as *M. sarcinula*.

**Grey speck (manganese deficiency) disease of oats,** G. Samuel and C. S. Piper (*Jour. Dept. Agr. So. Aust.*, *31* (*1928*), *Nos. 7*, *pp. 696–705*, *figs. 2; 8*, *pp. 789–799*, *figs. 5; also in So. Aust. Dept. Agr. Bul. 214* (*1928*), *pp. 51–68*, *figs. 7*).—A disease of oats known for many years on some alkaline soils in the southeastern part of South Australia has been identified with the gray speck disease (Dörrfleckenkrankheit) occurring for many years in the Netherlands, Norway, Sweden, Denmark, and Germany and supposedly identical with an oat disease of Canada, though apparently to be distinguished from a chlorosis of oats in the United States. In South Australia, as in Europe, the disease is made worse by liming, is ameliorated by the use of ammonium chloride or sulfate, and is completely cured by the use of manganese sulfate. Soil sterilization with heat, which increases the solubility of manganese, prevents the disease.

The healthy plants contain much more manganese than do diseased plants. In water cultures lacking manganese, oats developed gray speck symptoms, dying in the seedling stage unless manganese is supplied, 1 part in 4,000,000 being sufficient to prevent the disease. Sterilization of the Mount Gambier soil cured the disease, though it increased the proportion of the calcium ions in the soil. Excess lime does not, supposedly, cause the disease.

The disease is thought to result from the unavailability of manganese, though the precise factors responsible for this condition are not yet known. It is suggested that the name manganese deficiency disease be substituted for the imperfectly descriptive term gray speck until the cause is more exactly known.

**When to harvest rusted wheat,** J. B. Harrington (*Saskatchewan Univ., Col. Agr. Ext. Bul. 41* (*1928*), *pp. 4*, *figs. 2*).—Results from cutting wheat at dates previous to maturity at Saskatoon in 1927 show that the grain, though badly rusted, gained in weight and plumpness until two days before it was ripe, no evidence appearing in favor of early cutting, though most varieties were very susceptible. It is concluded that a crop already ruined by rust can not be improved by any method of harvesting.

**New yellows resistant varieties of cabbage in Indiana,** C. T. Gregory (*Ind. Acad. Sci. Proc.*, *43* (*1927*), *pp. 381*, *382*).—The yellows resistant cabbage varieties have succeeded well in Indiana, and the character of the resistance has held under all Indiana conditions. Previously only midseason to late varieties had been available, but three early varieties, Marion Market, Allhead Select, and Iacope, have now been found successful as to both yellows resistance and market value. Details are given as to other varieties.

**Observations concerning clover diseases**, E. B. MAINS (*Ind. Acad. Sci. Proc., 43 (1927), pp. 355–364, figs. 6*).—These notes deal with clover anthracnose (*Gloeosporium caulivorum* and *Colletotrichum trifolii*), powdery mildew (*Erysiphe polygoni*), bacterial leaf spot (*Bacterium trifoliorum*), Macrosporium leaf spot (*M. sarcinaeforme*), rust (*Uromyces fallens* (*U trifolii*)), mosaic, Cercospora spot, sooty spot (*Phyllachora trifolii* (*Polythrincium trifolii*)), root and crown rots, and nematodes.

**Cycles of growth in cotton root rot at Greenville, Tex.**, H. C. MCNAMARA, D. R. HOOTON, and D. D. PORTER (*U. S. Dept. Agr. Circ. 173 (1931), pp. 18, figs. 8*).—Repeated mapping of individual cotton root rot spots during a period of several years showed all spots to pass through a cycle in which after several seasons of regular growth there abruptly occurred a very marked reduction of infection. Only a few small centers were left, and from these parts vigorous activity was resumed. No correlation was evident between weather and the phenomenon observed because quite often two adjacent spots behaved contrastingly in the same year. No definite period was associated with the breaking up, this occurring at five-year intervals in some spots and at longer intervals in others. The authors believe that breaking up of large spots indicates a weak point in the life of the fungus and offers an opportunity for the use of soil disinfectants or the planting of nonsusceptible crops to carry reduction still further.

**Storage rots of the Jerusalem artichoke**, H. W. Johnson (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 4, pp. 337–352, figs. 8*).—Examination at the Minnesota Experiment Station of Jerusalem-artichoke tubers stored under three sets of conditions, namely, above-ground storage, root cellar, and cold storage, showed satisfactory keeping only in the cold storage, where the temperature ranged from 32 to 35° F. and the relative humidity from 89 to 92 per cent. On the other hand, high temperature and comparatively low relative humidity seemd to greatly favor the development of storage rots, among which *Botrytis cinerea* and *Rhizopus nigricans* were most frequent. Other fungi found included *R. tritici*, *Penicillium* sp., *Fusarium* sp., and *Pseudomonas fluorescens*.

Tests made of the pathogenicity of the various organisms showed *R. nigricans* to be an active parasite, causing a rapid soft rot of artichokes at 6, 13, and 20° C. The other organisms, with the possible exception of *B. cinerea*, which was not tested, caused only slight rotting below 20°. *Sclerotinia sclerotiorum*, not found occurring naturally in the material, caused a marked rotting even at a temperature as low as 2°. *Sclerotium rolfsii*, *Bacillus carotovorus*, and *B. aroideae* also caused some rotting between 2 and 20°. Of all the organisms, *R. nigricans* and *Sclerotinia sclerotiorum* were the only serious parasites within the normal range of temperature in the root cellar or cold storage, and both of these acted slowly near 0°.

[**Potato scab and scurf control**], E. G. SCHOLLANDER (*North Dakota Sta. Bul. 248 (1931), pp. 24, 25*).—In studies at the Williston Substation made in cooperation with W. E. Brentzel, only slight differences were recorded in four potato seed treatments, (1) corrosive sublimate 1 part to 1,000 of water, soaked 90 minutes, (2) corrosive sublimate as above plus 0.5 per cent of citric acid, 20 minutes, (3) hot formaldehyde 2 pints to 30 gal. of water, 3 minutes at 125° F., and (4) cold formaldehyde 1 pint to 30 gal. of water, 90 minutes. In fact, the control lot consisting of disease-free tubers outyielded all the treated lots both in total and marketable stock.

**The late blight of the sugar beet,** B. L. RICHARDS and C. M. TOMPKINS (*Phytopathology, 21 (1931), No. 3, pp. 289–314, figs. 4; abs. in Utah Sta. Circ. 95 (1931), p. 12*).—Describing the symptoms of late blight of the sugar beet, the authors assert that outbreaks in Utah are correlated with abnormally low rainfall in June, July, and August. Poor tillage, low fertility, and a disturbed water balance were contributing factors. Heavy irrigation following a long period of drought favored blight, particularly the root rot stage. Excess alkalinity and high organic content of the soil appeared to intensify the trouble. The authors assert that late blight is probably nonparasitic but due to an unbalanced water relationship within the plant.

**The relation of type of topping to storage losses in sugar beets,** C. M. TOMPKINS and S. B. NUCKOLS (*Phytopathology, 20 (1930), No. 8, pp. 621–635, figs. 3; abs. in Utah Sta. Circ. 95 (1931), p. 10*).—Based on an examination of more than 10,000 beets, evidence was secured of a positive correlation between decay in storage and the manner in which the beets were topped in the field. About 51 per cent of all the beets were topped at the base of the lowest leaf scar, and in this group only 37 per cent were healthy. When topped below this point, losses were decidedly increased and above this point decidedly decreased.

**Some pathological effects of the mosaic disease of sugar cane,** J. A. FARIS (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 2 (1928), Sup., pp. 20–29, figs. 7*).—In the spring of 1925 a comparative planting of mosaic and nonmosaic sugarcane was made to determine points regarding certain matters, among them losses from mosaic plants, effectiveness of roguing in mosaic control, manner and rapidity of spread, and seasonal variations of the spread of mosaic in sugarcane. The present partial report arose from certain features developing in the course of the comparative study.

The more rapid dying out of mosaic cane is attributed to the dwarfing of the root system in these canes. The reason for the reduction of yields in fields where the mosaic stalks appear as large as the healthy canes is supposed to be due to the poor tillering of stools showing mosaic.

**Some minor diseases of the POJ 2878 cane variety in Cuba** [trans. title], J. A. FARIS (*Mem. Conf. An. Asoc. Téc. Azucareros Cuba, 3 (1929), pp. 92–105, figs. 13; Eng. trans., pp. 84–97, figs. 13*).—The intensive local propagation of P. O. J. 2878 calls attention to certain diseases which are here discussed. Though they may be of minor importance in case of that variety, they may still give rise to problems more or less severe in case of other varieties.

**The behaviour of mosaic disease in seedlings P. O. J. 2714, 2725, and 2727 in Oriente Province,** R. MENÉNDEZ RAMOS (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 2 (1928), Sup., pp. 34–47, figs. 7*).—Experiences during the severe drought of the growing season of 1927-28 are said to have confirmed the good opinion formed of the canes planted previously in parts of Cuba and known as P. O. J. 2714, P. O. J. 2725, and P. O. J. 2727. These are said to possess remarkable vigor and drought resistance, and to ratoon satisfactorily, qualities of paramount importance in Cuba. The situation is detailed as existing in regard to mosaic, and as affected by the qualities of these P. O. J. canes, under open field conditions in Oriente Province.

These canes are not really immune, but with very little effort indicated they can be kept entirely free from the mosaic infection, and so eventually mosaic-free zones can be established. It is thought it would be very easy to maintain fields of these varieties entirely mosaic free.

**Pokkah-bong and twisted top diseases of sugar cane,** C. N. PRIODE (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 2 (1928), Sup., pp. 32–34*).—Pokkah boeng disease of sugarcane, known in Cuba for some years, is said now to attack the recently imported variety P. O. J.. and it is feared that if a combination of conditions favorable to the disease should occur, great loss would ensue.

The first symptoms usually appear as chlorotic spots on the bases of the young, partially unrolled leaves. Red specks and stripes usually show on the chlorotic parts, and in severe infection a wet rot may result. Further development is traced in connection with weather conditions.

Twisted top, hitherto often confused with pokkah boeng, sometimes developing on certain varieties in the dry season, is also described.

**Further notes on the pokkah-bong disease of sugar cane in Cuba** [trans. title], C. N. PRIODE (*Mem. Conf. An. Asoc. Téc. Azucareros Cuba, 3 (1929), pp. 106–114, figs. 6; Eng. trans., pp. 98–106, figs. 6*).—In the present report (E. S. R., 65, p. 349), the discussion is centered on pokkah boeng, considered a fungus disease. This is not expected to prove a serious drawback to the growing of any of the P. O. J. varieties now cultivated in Cuba, although in some sections and during years particularly favorable this condition may be more severe than in others.

**Controlling tomato leaf mold in greenhouses in Indiana**, C. T. GREGORY (*Ind. Acad. Sci. Proc., 43 (1927), pp. 382–385, figs. 2*).—Tomato leaf mold, considered one of the most serious diseases of greenhouse tomatoes in Indiana, does not occur everywhere, but where it occurs it usually kills all the leaves so that the plants look as if swept by fire, the upper and later fruits being small and poor.

Proper ventilation is an important factor in control, though leaf mold is a serious pest in some of the best greenhouses and it may not be present in some of the very poorly controlled houses.

Evidence detailed indicates that neither copper-lime dust nor Burgundy mixture spray will absolutely control leaf mold, but that the use of either is economical if the dust is applied so that it entirely fills the house or if the spray is delivered under 200 lbs. pressure. In either case, the under side of the leaf must be adequately reached.

**Vegetable seed treatment with special reference to the use of hot water and organic mercurials**, E. E. CLAYTON (*New York State Sta. Tech. Bul. 183 (1931), pp. 43, figs. 6*).—From the results of experiments extending over a period of nine years, the author reports that stimulation of growth may occasionally result from either chemical or heat treatments, but that such stimulation can not be produced at will. On the other hand, growth may be retarded by seed treatment. For example, Lima beans disinfected with a mercury compound produced small plants carrying 25 per cent less pods than the checks. Used as dusts, organic mercurials gave better results than did copper compounds, both in protecting seed and in developing seedlings. The best results were secured in early spring when germination was slow and chances of decay greatest. Damping-off in the greenhouse was partially controlled by organic mercury seed treatment.

In liquid treatments organic mercury proved safer than mercuric chloride, iodide, or cyanide. However, organic mercurial treated seeds may upon storage develop injury, such as temporary inhibition of germination in the case of the tomato. Treated seed germinated strongly immediately following treatment and three years later, but poorly at the end of six months. Carrots and some other species showed a rapid loss in germination following treatment. Dusting did not affect germination of seeds at any time, nor was there any material evidence that dusting lost its efficacy in storage. The author suggests that where organic mercury is used in liquid form the treatment be used close to planting time.

The immersion for 30 minutes of Brussels sprouts, cabbage, and cauliflower seed in water heated to 50° C. (122° F.) had no immediate effect on the germination, but did cause later reductions. Abbreviating the length of the immersion period below 30 minutes reduced the subsequent ill effects, hence the desirability of maintaining the hot water treatment only as long as actually needed, and of using the treatment just before sowing. Combined hot water and chemical treatments generally reduced germination more than either alone. The only chemicals that had a beneficial effect on subsequent germination were aluminum and zinc sulfates.

**Vegetable seed treatment**, E. E. CLAYTON (*New York State Sta. Bul. 597 (1931), pp. 15, figs. 6*).—The information here presented is a summary of the above.

**Plant diseases in a home garden**, E. B. MAINS (*Ind. Acad. Sci. Proc., 43 (1927), pp. 341–353, figs. 10*).—Brief descriptive accounts are given from observations made during 1926 and 1927 in a small garden in West Lafayette, Ind., which had been started in 1925, of China-aster yellows (a virus), wilt (*Fusarium conglutinans callistephi*), and rust (*Coleosporium solidaginis*); buttercup leaf spot (*Didymaria didyma*); delphinium powdery mildew (*Erysiphe polygoni*); gladiolus scab (*Bacillus marginatus*); gourd (*Cucurbita* sp.) mosaic; hollyhock Cercospora spot (*C. althaeina*) and rust (*Puccinia malvacearum*); iris leaf spot (*Didymellina iridis* (*Heterosporium gracile*) ), soft rot (*B. carotovorus*), and sclerotial rot (*Sclerotium* sp.); golden-banded lily Botrytis blight (*Botrytis* sp.); peony blight (*B. paeoniae*) and leaf spot (*Phyllosticta commonsii*); petunia mosaic; hardy pink anthracnose (*Volutella dianthi*); rose black spot (*Diplocarpon rosae* (*Actinonema rosae*)) and powdery mildew (*Sphaerotheca pannosa rosae*); snapdragon rust (*Puccinia antirrhini*); star-of-Bethlehem rust (*P. liliacearum*); sweet pea black root rot (*Thielavia basicola*) and powdery mildew (*E. polygoni*); tulip Botrytis blight (*B. tulipae*); and diseases, mostly of unknown causation, attacking other plants.

**The fungus causing leaf rot of the carnation**, W. BUDDIN and E. M. WAKEFIELD (*Brit. Mycol. Soc. Trans., 14 (1929), pt. 3–4, pp. 215–221, figs. 3*).—A fungus attacking carnations, previously described by Salmon and Ware (E. S. R., 60, p. 646) as leaf rot, is here descriptively discussed as recently taken under study which included comparison and culture work. This account, based on work with material furnished by Salmon and Ware, includes also related views of other investigators. The present authors state that the fungus examined, which resembled closely the nonpycnidial, parasitic stage of *Heteropatella antirrhini*, is the same as *Pseudodiscosia dianthi* described in 1921 by G. Höstermann and R. Laubert.[2]

**Find method to control root-knot of peony**, R. NELSON (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 10–16, figs. 2*).—Root knot disease, caused by the nematode *Caconema radicicola*, attacks the roots of the peony, especially in the sandy loam soils of southwestern Michigan, causing the plants to become stunted and to produce slender shoots devoid of flowers. Infested roots presoaked in water at 100° F. and then subjected to 120° for 20 or 30 minutes were replanted. Examined one year later, all the treated roots, more especially the 30-minute lots, were practically free, while the checks were severely infested.

In a second test, roots after presoaking were subjected to 115° for 1 hour, 120° for 30 minutes, and 125° for 10 minutes. A year later it was found that none of the treatments had been fully successful, but that 120° for 30 minutes gave 70 per cent of practically clean plants as compared with 20 per cent for the checks. Practical suggestions are submitted.

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[2] Gartenwelt, 25 (1921), No. 7, pp. 65–67.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Game laws for the season 1931–32: A summary of Federal, State, and Provincial statutes,** H. P. SHELDON and F. G. GRIMES (*U. S. Dept. Agr., Farmers' Bul. 1684 (1931), pp. II+52*).—This is the thirty-second annual summary of Federal and other game laws and regulations (E. S. R., 64, p. 51).

**Laboratory reproduction studies on the ground squirrel, Citellus tridecemlineatus pallidus Allen,** G. E. JOHNSON and N. J. WADE (*Biol. Bul., 61 (1931), No. 1, pp. 101–114, figs. 6*).—In studies by the Kansas Experiment Station, *C. tridecemlineatus* failed to reproduce in nearly all cases under the usual laboratory conditions, notwithstanding the fact that the diet provided the animals contained all the vitamins which have been found necessary for reproduction.

**Seasonal activity and growth in the Douglas ground squirrel,** E. R. EDGE (*Jour. Mammal., 12 (1931), No. 3, pp. 194–200, pls. 2, fig. 1*).—In this study trapping records and field and laboratory observations were made on *Otospermophilus douglasii*, chiefly in central western Oregon. The inactive period of this ground squirrel was found to extend from the first of November until the last of February.

"The inactive period is not a profound hibernation. The females are the first to become normally active in the spring and the first to become inactive in the fall. Breeding season begins late in March and in general does not last much longer than one month. The majority of young appear to be born about the middle of April. The average number of young to litter was 5, but this may be somewhat dependent upon favorable or unfavorable conditions. The newborn young are hairless, wrinkled, eyes not open, movement sluggish; they weigh approximately 11 gm. The gain in weight of the young averages from 8 to 10 gm. per week. The young leave the burrow about the eighth week; that is, early in June, and begin to forage on outside food."

**Life history of the Texas rice rat (Oryzomys palustris texensis),** A. SVIHLA (*Jour. Mammal., 12 (1931), No. 3, pp. 238–242, pl. 1*).—This is a report of studies of a rodent which is particularly common and abundant in the marshes of the southern coastal region of Louisiana. It is found there wherever dense vegetation offers food as well as protection from enemies.

**Eradication methods for rats and mice,** L. R. DICE and G. W. BRADT (*Michigan Sta. Circ. 138 (1931), pp. 11, figs. 5*).—A practical account of the most effective methods for the control of rats and mice, the rat proofing of buildings, the prevention of animals from securing food, poisoning, and trapping.

**The animal enemies of agriculture,** S. ROSTRUP and M. THOMSEN, trans. by H. BREMER and R. LANGENBUCH (*Die Tierischen Schädlinge des Ackerbaues. Berlin: Paul Parey, 1931, pp. XI+367, figs. 236*).—This is a German translation of the fourth Danish edition of this work (E. S. R., 61, p. 547).

**Methods of photographing living insects,** A. J. NICHOLSON (*Bul. Ent. Research, 22 (1931), No. 2, pp. 307–320, pls. 10, figs. 5*).—This account deals with the technic involved in photographing insects by daylight in the field and by flashlight in the field and in the laboratory.

**[Report of work in entomology],** R. H. PETTIT (*Michigan Sta. Rpt. 1930, pp. 205–221, figs. 18*).—A brief report is first given of the progress of work on entomological projects, 18 in number, followed by accounts of the occurrence of and control work with the important pests of the year. The pests noted include the raspberry mite, the flower thrips attacking peach, the cherry case bearer (*Coleophora pruniella*), fruit tree leaf roller (E. S. R., 65, p. 756), raspberry fruit worm, Mexican mealy bug (*Phenacoccus gossypii*) new to Michigan, greenhouse centipede (*Scutigerella immaculata*), a new mite on red cedar (*Phytoptus thujae*), giant skipper (*Epargyreus tityrus*), European pine-shoot moth, *Pissodes rotundatus*, hickory bark beetle, a pest of seed sweet corn (*Trogoderma versicolor*) (E. S. R., 65, p. 756), the pea moth, carrot rust fly, seed-corn maggot, *Tipula mingwe*, and ants in dwellings (*Lasius umbratus mixtus speculiventrus* Emery).

**Insects injurious to agriculture in Japan,** C. P. Clausen (*U. S. Dept. Agr. Circ. 168 (1931), pp. 116, pl. 1*).—This account of the insects that are of economic importance in Japan because of their injury to agriculture first refers briefly to the institutions in Japan doing entomological work, the entomological publications in Japan, distribution reports, and climatic conditions. The subject is then taken up under the headings of deciduous fruit insects (pp. 5–36), citrus insects (pp. 36–42), miscellaneous tropical and subtropical fruit insects (pp. 42, 43), field crop insects (pp. 43–58), cotton and tobacco insects (pp. 58–61), truck crop insects (pp. 62–76), tea insects (pp. 76–81), forest insects (pp. 81–92), and stored grain insects (p. 92). A list is given of 212 references to the literature cited, together with an index to species, genera, and higher groups.

**Handbook of the insects and other invertebrates of Hawaiian sugar cane fields,** compiled by F. X. Williams (*Hawaii. Sugar Planters' Sta., 1931, pp. 400, pls. 41, figs. 190*).—An introduction by F. A. G. Muir on biological control (pp. 11–32) is followed by a brief classification of the relation of invertebrates to sugarcane in Hawaii, including forms injurious to sugarcane, forms beneficial to sugarcane, and forms that appear more or less neutral in cane fields (pp. 33–38), and notes on their general structure and development (pp. 39–45). The insects are then taken up and considered, the arrangement being by orders (pp. 46–408), followed by accounts of the enemies of the nut grass (*Cyperus rotundus*) (pp. 308–313), the Myriapoda (pp. 313–320), Arachnida (pp. 320–334), Mollusca (pp. 334–337), Platyhelminthes (pp. 338, 339), and chapters on The Soil Fauna of Sugar Cane Fields (pp. 339–352) and The Nematodes Attacking Cane Roots in Hawaii (pp. 352–368), both by R. H. Van Zwaluwenburg, and Records of Introduction of Beneficial Insects into the Hawaiian Islands, by O. H. Swezey (pp. 368–377). A bibliography and an index are included.

**Borers severely injure fruit trees,** R. Hutson (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 27–30*).—This is a practical account of the fruit tree bark beetle, flat-headed apple tree borer, lesser peach tree borer, and the peach tree borer, in which it is pointed out that vigilance rather than expensive methods is needed to control these pests.

**[Work with lac insects],** D. Norris (*Indian Lac Assoc. for Research, Rpts. Com. and Dir. Indian Lac Research Inst., 1930–31, pp. 33–53, pl. 1*).—This report includes studies of the biology of the lac insect, its natural enemies—predatory and parasitic, artificial control of lac enemies, and pests of lac host trees.

**The critical point of parasitism and the law of Malthus,** F. Muir (*Bul. Ent. Research, 22 (1931), No. 2, pp. 249–251*).—This is a contribution from the Hawaiian Sugar Planters' Experiment Station.

**The composition of commercial calcium arsenate,** C. M. Smith and C. W. Murray (*Indus. and Engin. Chem., 23 (1931), No. 2, pp. 207, 208*).—This is an account of analyses made of 16 brands of recently manufactured calcium arsenate, the results being tabulated. "The presence of a basic arsenate of undetermined composition is definitely established. The average product contains 80 to 85 per cent of what is probably a mixture of tricalcium arsenate and this basic arsenate, together with about 6.5 per cent each of calcium hydroxide and calcium carbonate and small amounts of incidental impurities. The individual products may, however, differ rather widely from these average figures."

**Petroleum oils and oil emulsions as insecticides, and their use against the San Jose scale on peach trees in the South, H. S. Swingle and O. I. Snapp** (*U. S. Dept. Agr., Tech. Bul. 253 (1931), pp. 48, pls. 2*).—This bulletin treats of crude petroleum oils as regards their origin, principal constituents, and chemical and physical properties. Following an introduction, the authors deal with the subject under the headings of crude petroleum oils, lubricating oils, emulsification, effect of mineral oils upon insects, chemical and physical properties reported as influencing the toxicity of oils to insects, determination of the effectiveness of a spray against the San Jose scale, results of field experiments against the San Jose scale, effect of mineral oils upon plants, the wetting or spreading power of sprays and the relative covering power of various dormant sprays, and the compatibility of oil emulsions with various insecticides and fungicides. A list is given of 126 references to the literature cited.

**Effect of oil sprays on orchard fruit and foliage, M. D. Farrar** (*Ind. Hort. Soc. Trans., 1930, pp. 76-80, figs. 2*).—This account includes a summary in table and chart form of the results obtained through a survey of 62 Illinois commercial orchards, the data representing reliable counts made on grower sprayed fruit in both oil and lead sprayed orchards.

**Measuring the toxicity of insect fumigants, A. L. Strand** (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 4-8, fig. 1*).—This is a contribution from the Minnesota Experiment Station in which a review of the methods used for establishing the relative toxicities of insect fumigants is presented. "It is shown that the greatest error in these methods rises from the attempt to determine minimum lethal concentrations. A method of measuring relative values by comparing concentrations which kill 50 per cent of the test insects in a period of 5 hours has been investigated. These concentrations may be designated as the 5-hour median lethal concentrations. The method appears to possess greater possibilities for accurate work on fumigants than those now in general use."

**Thrips tabaci Lind. as a vector of plant virus disease, K. M. Smith** (*Nature [London], 127 (1931), No. 3214, pp. 852, 853, figs. 3*).—In the experiments conducted the author found the onion thrips to be a most efficient vector of a virus disease of *Solanum capsicastrum*, which is characterized by numerous concentric circles on the leaves. This is said to be the first record of plant virus transmission by thrips in the British Isles.

**Studies on the beet leafhopper, G. F. Knowlton** (*Utah Sta. Circ. 95 (1931), p. 9*).—A reference is made to the inoculation of beets with curly top virus in 1928 and 1929 by means of infective beet leafhoppers in the course of studies of curly top resistance in sugar beets. Many native and introduced plants were found to serve as hosts to the beet leafhopper during the course of studies made on the breeding grounds.

**Notes on a few Homoptera from Utah, G. F. Knowlton** (*Fla. Ent., 13 (1929), No. 3, pp. 45-51*).—Collections made in connection with a study of the distribution and breeding grounds of the beet leafhopper by the Utah Experiment Station are recorded. The list includes a number of species new to the State and new localities for many of the forms previously known to occur in Utah.

**Notes on Utah Hemiptera,** H. J. Pack and G. F. Knowlton (*Canad. Ent., 62 (1930), No. 11, pp. 248–250; abs. in Utah Sta. Circ. 95 (1931), p. 11*).—These notes contributed from the Utah Experiment Station report upon the occurrence in the State of 36 species of Hemiptera of the superfamily Scutelleroidea.

**Notes on Utah Heteroptera and Homoptera,** G. F. Knowlton (*Ent. News, 42 (1931), Nos. 2, pp. 40–43; 3, pp. 68–72; abs. in Utah Sta. Circ. 95 (1931), pp. 11, 12*).—These notes contributed from the Utah Experiment Station include data on the occurrence in the State of 111 forms of Heteroptera and Homoptera.

**The inheritance by a leafhopper of the ability to transmit a plant virus,** H. H. Storey (*Nature [London], 127 (1931), No. 3216, p. 928*).—In recent studies of the inheritance of the ability of *Cicadulina* (*Balclutha*) *mbila* Naude to transmit the virus disease of corn known as streak, the author has obtained races which breed true, every individual of which will invariably transfer the streak virus under suitable conditions.

**Notes on Utah Lachnea (Aphididae),** G. F. Knowlton (*Canad. Ent., 62 (1930), No. 7, pp. 152–161, figs. 6; abs. in Utah Sta. Circ. 95 (1931), pp. 10, 11*).—This is a contribution from the Utah Experiment Station dealing particularly with species of the genus Lachnus and with *Tuberolachnus viminalis* (Boyer), which is very abundant in northern Utah, feeding on the bark of both small twigs and larger branches of several species of willow.

**New aphicides,** A. N. Tissot and W. L. Thompson (*Fla. Ent., 14 (1930), No. 1, pp. 7–12*).—In this contribution from the Florida Experiment Station the results of tests made with some of the new aphicides are reported in tabular form.

**Some new injurious Phytophaga from South Africa,** G. E. Bryant (*Bul. Ent. Research, 22 (1931), No. 2, pp. 253–257, figs. 5*).—*Rhembastus pomorum* injuring young apples and foliage, *Longitarsus crotalariae* feeding on leaves of sunn hemp (*Crotalaria juncea*), *Monolepta munroi* feeding on Acacia, and *Notomela fulvicollis* feeding on leaves of *Xanthoxylon capense*, all in the Transvaal and the last-named also in Natal, and *Scelodonta vitis* feeding on grapevine foliage in Natal, are described as new.

**Experiments with oil sprays in control of red scale,** R. H. Smith and W. Ebeling (*Calif. Citrogr., 16 (1931), No. 9, pp. 410, 448, fig. 1*).—This is a practical summary based upon the experimental use of oil sprays against red scale from 1926 to 1930 (E. S. R., 65, p. 549) by the California Citrus Experiment Station. The methods employed are described, and the results of tests in 10 lemon groves, the effectiveness of spray on the leaves, fruit, and bark in a grove, and the combination treatment for resistant red scale as tested in two lemon groves are discussed, the details being given in tabular form.

The work indicates that wide variation may be expected in the degree of clean-up obtained with oil sprays, due chiefly to factors relating to natural mortality, but that, even under conditions favorable to control, oil sprays alone appear to be distinctly limited in their effectiveness. Many insects on the rough bark apparently will survive a heavier dose of oil than the tree will tolerate. It is considered evident that combination treating affords the most dependable means of controlling resistant red scale on lemon trees. Further observations of the year indicate that spray operators in general should exercise greater care in regard to the thoroughness of the application of the spray, since a lack of thoroughness is one of the weakest points in the combination treatment.

**Coccid enemies of coffee [in the Dutch East Indies]** [trans. title], H. Begemann (*Arch. Koffiecult. Nederland. Indië, 3 (1929), No. 3, pp. 113–166, figs. 27; abs. in Rev. Appl. Ent., 18 (1930), Ser. A, No. 7, pp. 362, 363*).—This is a summary of information on the coccid enemies of coffee in the Dutch East Indies.

**Notes on Lymire edwardsi Grote, the rubber tree caterpillar,** H. E. Bratley (*Fla. Ent., 13 (1929), No. 3, p. 44*).—It is concluded that *L. edwardsi* is of general distribution where its host may occur, which includes the more semitropical area of Florida. The two important parasites—the hymenopteran *Brachymeria robusta* (Cresst.) and the dipteran *Phorocera claripennis* Macq.—were found to parasitize more than 96 per cent of the larvae and pupae received from Vero Beach and from St. Petersburg.

**The biology of the stalk borer, Papaipema nebris (Gn.),** G. C. Decker (*Iowa Sta. Research Bul. 143 (1931), pp. 289–351, figs. 22*).—This is a report of studies of the life history and bionomics of the stalk borer and its control. This borer is a native species, widely distributed in the United States, which normally feeds upon *Ambrosia trifida* but occasionally causes considerable damage to corn and other crops and is known to attack 176 different species of plants.

In the studies conducted during the years 1926 to 1930, inclusive, there was found to be one generation each year. The overwintering eggs hatch during late April or early May, and after a growing period of from 9 to 18 weeks the larvae pupate. The moths emerge during August or September and begin at once to deposit eggs for the next year's brood upon the leaves of grass and weeds. The number of larval instars required to complete development varied from 7 to 16, average 8, depending upon the kind and quality of the food upon which the larva fed. Natural enemies were found to play an important part in holding it in check. Its parasites and predators are noted. The elimination of the natural host plants of the borer from the fence row flora and the burning of infested fence rows and grasslands between November 1 and May 1 as a means of control are recommended.

A list is given of 42 references to the literature cited.

**Biology of the Indian-meal moth on dried fruits in California,** J. C. Hamlin, W. D. Reed, and M. E. Phillips (*U. S. Dept. Agr., Tech. Bul. 242 (1931), pp. 27, fig. 1*).—The authors here report upon the biology of the Indian-meal moth, one of the most destructive pests attacking dried fruit in storage in California, having been found in varying numbers in every dried-fruit packing establishment examined. Following a brief introduction and an account of the history and distribution of the pest, descriptions are given of its life stages, followed by accounts of its food habits, nature of damage, plan of biological studies, rearing methods, and seasonal history. Life history studies are then considered at some length, followed by an account of parasites, a brief summary, and a list of 22 references to the literature cited.

The shortest life cycle encountered in the study was 27 days on figs, and the longest 305 days upon prunes. The cycle of individuals raised on raisins ranged from 33 to 302 days, resulting in a maximum of five generations a year on raisins and four on prunes.

**Gall midges (Cecidomyidae) whose larvae prevent seed production in grasses (Gramineae),** H. F. Barnes (*Bul. Ent. Research, 22 (1931), No. 2, pp. 199–203*).—In this contribution from the Rothamsted Experimental Station, notes are given on 18 species of gall midges whose larvae prevent seed production in grasses and a list of grasses whose seed production is affected by gall midge larvae.

**The Cecidomyiidae as grass pests** [trans. title], W. Tomaszewski (*Arb. Biol. Reichsanst. Land u. Forstw., 19 (1931), No. 1, pp. 1–15, pl. 1, figs. 16*).—Included in this account is a list of the Gramineae attacked in Europe, with the species of gall gnat implicated.

**A new predacious gall midge (Dipt., Cecidomyidae)**, H. F. Barnes (*Bul. Ent. Research, 22 (1931), No. 2, pp. 205–207, figs. 2*).—Under the name *Triommata coccotroctes* n. g. and sp. the author describes a gall midge, the larvae of which are predacious on an undetermined species of mealybug.

**Dexia ventralis Aldrich, an imported parasite of the Japanese beetle**, R. W. Burrell (*Jour. Agr. Research [U. S.], 43 (1931), No. 4, pp. 323–336, figs. 7*).—An account is given of the dipterous parasite *D. ventralis*, first found in Chosen in the summer of 1922 to be the common larval parasite of a number of Scarabaeidae in that country in the course of the work by investigators from the Japanese Beetle Laboratory of the U. S. D. A. Bureau of Entomology. The Japanese beetle does not occur in Chosen, but it was determined experimentally that this parasite would accept it as a host. Parasitism by it having been accomplished in Japan, the species was shipped to this country as larvae in host grubs, about 30 per cent arriving alive. Emergence from the host and pupation have usually taken place while the shipments were en route, about 85 per cent of the parasites received in this condition in 1927 having produced adults. Thus far, four colonies of *D. ventralis* have been liberated in the United States, one of which is apparently established, recoveries of adults having been made consistently from this colony.

It is said to be fairly easy to induce mating in captivity by using large cages, although propagation experiments have been unsatisfactory. The parasite larva has three instars. Two broods are produced in this country, and the winter is passed as an immature maggot within the host. The adults are active mainly during the twilight periods and on cloudy days. Larvae of *D. ventralis* can penetrate into and develop in larvae of the host in all stages, including the prepupal; but third-stage hosts are preferred. Suitable host material is available at all times. Host histolysis is not necessary to the development of the parasite larvae, and the species can apparently maintain its existence on a single host.

**Control of the walnut husk fly in 1929**, A. M. Boyce (*Diamond Walnut News, 12 (1930), No. 3, pp. 14–16, figs. 5*).—This is a progress report of studies of *Rhagoletis suavis completa* Cress. for the season 1929, contributed from the California Citrus Experiment Station. It is stated that a new species has been discovered attacking Persian walnuts in Arizona, thereby increasing the number known to attack Persian walnuts in the United States to four, only one of which is at present established in California. The known infestation in California up to the end of 1929 included about 1,500 acres of walnuts, extending over an area of approximately 25 square miles.

The results obtained from tests show approximately 30 per cent of the walnuts with infested husks to have been reduced from the "Diamond" to the "Emerald" grade. The lot left lying on the ground for a week with the infested husks adhering had about a 60 per cent reduction in grade. In laboratory control work the newer insecticides, comprising various compounds of silicofluorides, exhibited rapid killing action. In control work in the field, burning of the foliage resulted in every instance where sweetened material was used in the spray, the degree of burn apparently being proportional to the amount of sweetened material used.

The results of work, the details of which during the season 1929 are presented in tabular form, led to the recommendation of the following program for the infested acreage: "Make two timely applications of basic arsenate of lead either as a spray or dust. As a spray use 4 lbs. of basic arsenate of lead to 100 gal. of water (without spreader), applying about 20 gal. per full-sized tree; for dusting, a 25 per cent basic arsenate of lead—hydrated lime dust is suggested—applying from 1 to 2 lbs. per full-sized tree. The time of application will depend upon the seasonal emergence of the flies."

**High and low lethal temperatures for the western pine beetle, J. M. Miller** (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 4, pp. 303–321, figs. 3*).—This is a report of studies of the effects of high and low temperatures on the brood stages of the western pine beetle conducted in the laboratory at Palo Alto, Calif., and in the field at points in California, Oregon, and Idaho from 1920 up to the end of 1929 with a view to determining (1) the high temperatures which result in mortality when solar heat is used for control and (2) the low temperatures which result in the death of the overwintering brood stages when severe cold weather occurs in infested areas. The details of the studies so far as they had progressed are reported in tabular form.

It was found that "when infested bark is removed from the log and placed where it is exposed to sunlight during the midday period, it will reach temperatures ranging from 110 to 130° F. when the corresponding air temperature ranges from 80 to 95°. A partial mortality of the broods will result if bark temperatures range from 100 to 115° daily for a period of several days. Complete mortality is assured if bark temperatures reach 115 to 118° for a period of two hours or more. No broods survive a brief exposure if the temperature of the bark reaches a maximum of 120°.

"When larvae are removed from the outer bark and exposed to warm air under conditions which retard evaporation, mortality occurs at about the same points of temperature as in the bark. If rapid evaporation is permitted, paralysis and mortality occur at temperatures about 5° lower than those at which they occur in the bark. Mortality of the larvae follows freezing when bark temperatures are lowered below 0°. Partial mortality occurs at zero in broods which overwinter in the yellow pine belt of the Sierra Nevada region. Mortality at —5° exceeds 60 per cent, and practically no larvae survive at —10°. Temperatures within the range from 0 to —10° are consistently critical, regardless of the rate at which the temperature of the bark is lowered or warmed back from subzero to normal temperatures; complete mortality develops within this range regardless of whether the larvae are actively developing or dormant at the time the bark temperature is lowered to the critical points."

A high mortality of the pupae occurs at temperatures between 5 and —5° and is complete at —8°. A high mortality of the adults occurs between 12 and 5° and is nearly complete at 0°. The results available indicate that partial destruction of eggs in the cambium occurs at temperatures between 5 and —10°. The destruction recorded at —15° was around 90 per cent, indicating that eggs have greater resistance to cold than do other brood stages. Normal activity of the larvae occurs between 55 and 90°. Broods which overwinter in regions where the minimum winter temperatures are below zero apparently develop greater resistance to cold than in regions with mild winter climates.

**White pine weevil is increasing in Michigan, E. I. McDaniel** (*Michigan Sta. Quart. Bul.*, *14* (*1931*), *No. 1, pp. 36–38, figs. 2*).—A brief practical account of this pest, in which it is pointed out that reforestation plantings may be protected by interplanting hardwoods in pine.

**Insect pests of sugar cane.—VII, The weevil borers—species other than the Hawaiian, T. E. Holloway** (*Facts About Sugar*, *26* (*1931*), *No. 7, pp. 302–304*).—This account of the weevil borers other than those occurring in Hawaii is in continuation of the work previously noted (E. S. R., 65, p. 657).

**The red harvester ant and how to subdue it, V. L. Wildermuth and E. G. Davis** (*U. S. Dept. Agr., Farmers' Bul. 1668* (*1931*), *pp. II+22, figs. 14*).—This is a practical summary of information on *Pogonomyrmex barbatus* F. Smith, which causes considerable losses in cultivated fields and orchards in the Southwestern States. The authors describe various forms, their economic importance, the habits of these ants, and the structure of their underground nests, together with some of the best methods of eliminating their colonies. The futility of some of the measures that are frequently recommended is emphasized.

**Notes on Meteorus (Zemiotes) nigricollis Thomson, an occasional parasite of the European corn borer,** H. L. Parker (*Ent. Soc. Wash. Proc., 33 (1931), No. 5, pp. 93–103, figs. 14*).—An account is given of an occasional parasite of the European corn borer which has been taken from mugwort in northern and western France. It appears to be of no importance as a controlling factor for this borer.

**The larval and pupal anatomy of Stenomalus micans Ol. (Pteromalidae), a chalcid endoparasite of the gout-fly of barley (Chlorops taeniopus Meig.), with some details of the life history of the summer generation,** H. G. H. Kearns (*Parasitology, 23 (1931), No. 3, pp. 380–395, figs. 5*).—Samples of "gouted" barley examined from a number of counties in southern England were found to contain two species of endoparasite, *S. micans* Oliv., a chalcid, and *Coelinius niger* J. Rees, a braconid. Chlorops infestations were severe in 1928 in many districts, and the majority of the gouted shoots were of winter-type damage, of which 68 per cent were parasitized, two-thirds by *S. micans*. Descriptions are given of the larvae and pupae of *S. micans*, which passes through five larval instars, in the first of which it appears to be partly predacious.

**New chalcidoid egg-parasites from south Asia,** C. Ferrière (*Bul. Ent. Research, 22 (1931), No. 2, pp. 279–295, figs. 6*).—Fourteen chalcidoid egg parasites reared from insects of more or less economic importance in south Asia are described as new, and the eulophid genus Pareuderus is erected.

**A new species of Encarsia from Cuba (Hymenoptera: Aphelininae),** A. B. Gahan (*Ent. Soc. Wash. Proc., 33 (1931), No. 5, pp. 121, 122*).—An aphelinid reared from the woolly white fly in Santiago de las Vegas, Cuba, is described as new under the name *E. cubensis*.

**Three new Braconidae parasitic on bark beetles,** R. A. Cushman (*Jour. Wash. Acad. Sci., 21 (1931), No. 13, pp. 301–304*).—*Meteorus hypophloei* parasitic on *Hypophloeus* sp., at Metaline Falls, Wash.; *Coeloides dendroctoni* parasitic on the mountain pine beetle and *Ips oregoni* (Eich.), at Sula, Mont.; and *C. scolyti* parasitic on *Scolytus* spp., at Metaline Falls, Wash., are described as new.

**Contribution to the life history and to the postembryonic development of Ixodes ricinus L.** [trans. title], H. Falke (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u. Ökol. Tiere, 21 (1931), No. 3–4, pp. 567–607, figs. 25*).—This contribution on the castor-bean tick (*I. ricinus*) is accompanied by a list of 58 references to the literature.

**The Ixodoidea of Argentina** [trans. title], R. L. Dios and R. Nopoff (*Compt. Rend. Soc. Biol. [Paris], 106 (1931), No. 5, pp. 393, 394*).—Notes are presented on the parasitic habits of 13 species of ticks observed in Argentina.

## ANIMAL PRODUCTION

**The effect of fluorine on the calcium metabolism of albino rats and the composition of the bones,** F. J. McClure and H. H. Mitchell (*Jour. Biol. Chem., 90 (1931), No. 1, pp. 297–320, fig. 1*).—Supplementing work previously noted (E. S. R., 65, p. 366), at the Illinois Experiment Station rats were fed in pairs a ration to which was added fluorine in amounts comparable with concentrations that result from feeding raw rock phosphate. Synthetic mixtures of tricalcium phosphate and sodium fluoride and tricalcium phosphate and calcium fluoride containing approximately 4 per cent of fluorine were added to the basal ration in amounts equivalent to approximately 0.01, 0.03, and 0.06 per cent of fluorine for the sodium fluoride and about 0.03 and 0.06 per cent for the calcium fluoride. The consumption of food of each pair was limited to the appetite of the animal consuming the least feed. All the rats were carried through two 10-day balance periods.

The results of the study showed that either calcium or sodium fluoride fed at levels of 0.0313 or 0.0623 per cent of fluorine inhibited growth, aside from any effect on the consumption of food. The higher level of sodium fluoride appeared to lower food consumption, while the corresponding level of calcium fluoride had no such effect. The calcium balance was not affected by sodium or calcium fluoride at levels of 0.0106 or 0.0313 per cent of fluorine, but at a level of 0.0623 per cent both salts lowered the percentage of calcium that would have been retained.

Sodium fluoride at levels approximating 0.03 and 0.06 per cent of fluorine caused a consistent increase, averaging 1.3 per cent, in the ash content of the bones of the rats and a significant though not as constant decrease in the calcium content of the ash, averaging 1.05 per cent. The phosphorus content of the ash was not significantly affected, but the ratio of calcium to phosphorus in the ash was depressed. Calcium fluoride at the same levels tended to increase the ash content of the bones and to cause a significant depression in the calcium in the ash of the femur, but not of the humerus. Calcium fluoride had no effect on the percentage of phosphorus in the ash and did not affect the calcium-phosphorus ratio.

These results show that fluorine in the soluble form of a sodium salt may cause the deposition of an apparently abnormal constituent in the bones or an abnormal deposition of a noncalcium constituent, possibly a fluoride of a mineral other than calcium. The fluorine also interfered with the deposition of calcium in the bones. At levels of approximately 0.03 and 0.06 per cent of fluorine both the calcium and sodium salts brought about the characteristic abnormalities of the teeth caused by fluorine, and both the insoluble calcium and the soluble sodium salts were equally effective in causing these changes in the tooth structure.

**Concerning the use of cottonseed meal in the diet of the rat,** W. D. Gallup (*Jour. Biol. Chem., 91 (1931), No. 1, pp. 387–394*).—This study at the Oklahoma Experiment Station was planned to show that cottonseed meal contained physiologically active gossypol in amounts sufficient to influence the growth and well-being of rats. The basal ration, containing 40 parts of cottonseed meal, was made up of cottonseed meal, yellow corn, wheat, alfalfa, salt, and calcium carbonate. To this basal ration were added different amounts of iron salts. Some groups were fed standard cottonseed meal, while other groups received autoclaved meal. The experiment lasted 120 days.

The unhealthy condition and retarded growth of the rats fed 40 per cent of standard cottonseed meal was shown to be due to the presence in the meal of appreciable amounts of physiologically active gossypol. The effect of the gossypol became apparent during the last 60 days of the test. Adding inorganic iron to the ration or substituting autoclaved meal for the standard meal brought about an improvement in the growth and well-being of the rats.

**Commercial feeding stuffs,** L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 328 (1931), pp. 44*).—This is the usual report (E. S. R., 65, p. 553) of the protein, fat, and fiber contents of 2,060 samples of feeding stuffs collected for official inspection during December, 1930.

**Silage and trench silos in Colorado, H. B. Osland** (*Colorado Sta. Bul. 380 (1931), pp. 21, figs. 11*).—The advantages of silage, crops suitable for silage in Colorado, and the value of silage for dairy cattle, for fattening and wintering cattle, for fattening lambs, and for breeding ewes are discussed in this bulletin. A section on trench silo construction and use is noted on page 184.

**Barley as a fattening feed for cattle and swine in South Dakota, J. W. Wilson and T. Wright** (*South Dakota Sta. Bul. 262 (1931), pp. 39*).—In the studies in part 1 of this bulletin, 2-year-old steers and calves were used. As a single feed barley was not equal to corn for either class of animals. Adding linseed meal to the ration increased the value and cost of the gains. On the average it required about one-eighth more barley for 1 lb. of gain than it did corn, this being attributed to the higher percentages of oil in the corn and of protein and hull in the barley. Corn silage proved to be satisfactory as the sole roughage for calves on a grain ration.

The results reported in part 2, some of which have been previously noted (E. S. R., 63, p. 62), showed that, as compared with shelled corn, ground barley fed without a protein supplement to spring pigs on rape pasture had 93.3 per cent of the feeding value of the corn. Ground barley fed with tankage to pigs on pasture had a feeding value of 82 per cent, and when fed with tankage and linseed meal had a feeding value of 89 per cent of that of corn. Substituting linseed meal for one-third of the tankage in a ration of ground barley and tankage fed to pigs on pasture effected only a slight saving in feed. Limiting the amount of tankage fed resulted in a slight decrease in cost of gains. The carcasses of pigs fattened on ground barley, a protein supplement, and pasture were as good as those fattened on corn.

For fall pigs in dry lot, ground barley fed with tankage and alfalfa hay had 90 per cent of the feeding value of corn fed with the same supplements. Ground barley fed with tankage, linseed meal, and alfalfa hay compared with shelled corn and the same supplements fed to fall pigs in dry lot had a feeding value of 98 per cent of that of corn. Replacing one-third of the tankage with linseed meal in a ration of ground barley, tankage, and alfalfa hay revealed a value of 90 per cent of that of corn.

The average of the experiments with ground barley and a protein supplement fed to pigs on pasture was 86 per cent of the feeding value of corn, while for pigs in dry lot it had a feeding value of 95 per cent of that of corn.

**Steer feeding** (*Kentucky Sta. Rpt. 1930, pt. 1, p. 21*).—A lot of 27 steers averaging 942 lbs. per head was fed from January 7 to May 26 on pasture with access to a barn, while another lot of 28 steers averaging 951 lbs. per head was fed for the same period on pasture with no shelter. In both lots the average daily ration consisted of 2 lbs. of cottonseed meal, 10 lbs. of shelled corn, a little over 30 lbs. of corn silage, 8 lbs. of bluegrass chaff, and all the clover hay they would consume. The average gain per head was 236 lbs. in the lot with shelter and 231 lbs. in the lot without shelter.

**Make study of rickets in calves, C. F. Huffman** (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 42–45, figs. 4*).—The preliminary results of this study indicate that calves require vitamin D. On a basal ration low in vitamin D and away from sunlight calves developed rickets, while calves fed the same ration but turned into an open lot were normal. Supplementing the basal ration with cod-liver oil in the lots kept away from the sunlight prevented the development of rickets, and the same was true when 2 lbs. of sun-cured timothy hay was fed to these lots. It is deemed likely that hay is the principal source of vitamin D for dairy cattle during the winter months, and since calves begin to eat hay at an early age this explains why under ordinary farm conditions calves fail to show signs of rickets during this period.

**Soybean and alfalfa hays for wintering pregnant ewes,** W. E. Hammond, J. M. Evvard, and C. C. Culbertson (*Iowa Sta. Bul. 282 (1931), pp. 241–256*).—The object of this experiment was to determine the relative value of alfalfa hay, soybean hay, and two different combinations of these hays, and to note the effect of the soybean hay upon the health and production of ewes and their offspring. Ewes were divided into four lots of 10 head each and bred to a Hampshire ram beginning October 3. They were fed until the lambs were 60 days old. The ration fed to lot 1 consisted of shelled corn, limited to 1 lb. per ewe, corn silage, alfalfa hay full-fed, and salt. The other lots received shelled corn in amounts limited so as to regulate gains to approximately those of lot 1, and all received silage and salt. In addition lot 2 received approximately three-fourths as much alfalfa hay as lot 1 and soybean hay full-fed; lot 3, approximately one-half as much alfalfa hay as lot 1 and soybean hay full-fed; and lot 4, soybean hay full-fed.

There were no significant differences in the feeding value of the soybean and alfalfa hay, and the combinations of the two hays were also efficient roughages. When the soybean hay was fed, less grain was required to keep the ewes in comparable condition than when alfalfa hay was fed, and a combination of the hays required even less grain than either hay fed singly. Soybean hay stimulated salt consumption. Using the edible feed consumed daily as the basis of comparison, 100 lbs. of soybean hay fed in lot 2 saved 102 lbs. of alfalfa hay and 54 lbs. of corn fed in lot 1. On the same basis, 100 lbs. of soybean hay fed in lot 3 saved, as compared with lot 1, 108 lbs. of alfalfa hay and 26 lbs. of corn, while 100 lbs. of this hay fed in lot 4 saved 107 lbs. of alfalfa and 11 lbs. of corn as fed in lot 1. When both hays were available a combination of the two with corn, silage, and salt was desirable, although either hay alone produced satisfactory results in this test.

There were no significant differences in the lambs born in the different lots. The substitution of soybean hay for part or all of the alfalfa hay resulted in an increased yield of scoured wool by the ewes.

**Make tests of rations for lambs,** G. A. Brown (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 45–48*).—In this test eight lots of 16 western feeding lambs each, averaging 63 lbs. per head, were fed from November 14 to February 6, except lots 1, 7, and 8, which were fed to February 20. In addition one lot of 20 native medium wool lambs, averaging 60 lbs. per head, and a similar lot of native fine wool lambs, averaging 59 lbs. per head, were fed from November 28 to February 6 and 20, respectively. Alfalfa hay was fed to each of the first eight lots, and in addition the respective lots received shelled corn; shelled corn and silage; shelled corn and linseed meal 7:1, and silage; oats and linseed meal 7:1, and silage; oats and linseed meal 14:1, and silage; barley and silage; oats and silage; and wheat and linseed meal 7:1, and silage. Lots 9 and 10 were fed the same ration as lot 3.

The average daily gains in the respective lots were 0.31, 0.36, 0.42, 0.37, 0.37, 0.37, 0.31, 0.33, 0.47, and 0.34 lb. per head. Adding corn silage to the shelled corn and alfalfa hay ration increased the rate and economy of gains, while the further addition of linseed meal resulted in more rapid gains and a slight reduction in the cost of these gains. Adding linseed meal to a ration of oats, silage, and alfalfa hay increased the rate and economy of gains, but the use of one-fifteenth part by weight of linseed meal was as efficient as the use of one-eighth part. Barley, silage, and alfalfa hay proved to be almost as satisfactory as corn, silage and alfalfa hay, and either of these rations produced more rapid and economical gains than oats, silage, and alfalfa hay. The ration containing wheat did not prove as satisfactory from the standpoint of rapidity or economy of gains as did similar rations containing corn or oats. The native medium wool lambs gained more rapidly and at a lower cost than did the western lambs or the native fine wool lambs.

**Wheat compared with corn as a feed for hogs** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 20, 21*).—To compare wheat and corn four lots of nine pigs each, averaging 115 lbs. per head, were fed for 50 days. Lot 1 made an average daily gain of 1.7 lbs. per head and consumed 3,122 lbs. of ground wheat soaked 12 hours and 283 lbs. of tankage. Lot 2 gained at the rate of 1.72 lbs. per head daily and ate 2,632 lbs. of shelled corn soaked 12 hours and 393 lbs. of tankage. Lot 3 ate 1,616 lbs. of ground wheat and a like amount of ground corn, mixed and soaked 12 hours, and 558.8 lbs. of tankage and made an average daily gain of 1.93 lbs. per head. Lot 4 gained 1.66 lbs. per head per day and consumed 2,807 lbs. of whole wheat soaked 12 hours and 402 lbs. of tankage.

**The nature of the highly unsaturated fatty acids stored in the lard from pigs fed on menhaden oil, J. B. Brown** (*Jour. Biol. Chem., 90 (1931), No. 1, pp. 133–139*).—In this study two lots of two pigs each were fed a basal ration of corn, tankage, alfalfa meal, and salt for 37 days. During this period the control lot consumed 330 lbs. of the basal ration, while the other lot ate 270 lbs. of the basal ration and 44 lbs. of refined menhaden oil. Analytically this oil gave an iodine number of 177.6 and a saponification number of 187.5. Calculated on the basis of 1,620 calories per pound of basal ration, the caloric intake of the oil-fed pigs was 16 per cent greater than that of the controls. The pigs on the basal ration gained 61 lbs. during the period and those receiving the oil gained 63 lbs. There was no apparent effect on the health of the animals due to the feeding of oil.

At the end of the feeding period the pigs were slaughtered, and samples of back fat and leaf fat and the livers and brains were removed for analysis. The analyses showed that when the ration contained 14 per cent of menhaden oil, the lipids and fatty acids of the livers were decidedly more unsaturated than those of the controls, indicating a mobilization of highly unsaturated acids. Under the same conditions there was a storage of 2.7 per cent of highly unsaturated acids in the lard. The highly unsaturated fatty acids deposited were of about the same molecular weight and of lower iodine number than the mixture of acids isolated from the original menhaden oil.

**Feeding and management of horses, A. B. Caine** (*Iowa Sta. Circ. 130 (1931), pp. 54, figs. 14*).—The principles and practices of feeding horses; the management, breeding, and selection of breeding animals; the marketing of horses; and the use of multihitches are described in this publication.

**[Experiments with poultry in Kentucky]** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 15–20*).—The results of several experiments, some of which have been continued (E. S. R., 64, p. 168), are noted.

*Metabolism in the chicken.*—A basal ration consisting of skim milk, yellow corn, wheat middlings, salt, and cod-liver oil was fed to six lots of chicks. In addition the respective lots received tricalcium phosphate; tricalcium phosphate with calcium carbonate; tricalcium phosphate with magnesium carbonate; calcium carbonate; magnesium carbonate; and magnesium carbonate with calcium carbonate. At the end of 6 weeks the chicks in lot 1 were heaviest, while those in lot 2 were smaller, less vigorous, and more unevenly feathered than those in lot 1. In lot 3 the chicks grew slowly, were nervous, weak, had swollen leg joints, most of them were unable to stand erect, moved only when disturbed, their toes turned outward, and they walked on the distal ends of the tarsometatarsus. The chicks in lot 4 were normal in weight but were less vigorous and more nervous, while those in lots 5 and 6 did not grow as well as those in lot 1. Most of the chicks in the last two lots had swollen leg joints, but not as severe as in the case of lot 3. The largest percentage of ash was found in the leg bones of lot 1, the smallest in lot 3, and approximately the same amounts in the other lots. The percentage of calcium was distinctly lower in the ash of birds receiving magnesium carbonate, but there was little difference in the percentage of magnesium and phosphorus.

Another test showed that calcium lactate could not be used as a substitute for tricalcium phosphate or calcium carbonate. Equal parts of calcium carbonate and disodium hydrogen phosphate could be adequately substituted for tricalcium phosphate when fed at the same calcium level.

*The nutritive value of eggs as affected by various vitamin D supplements given to the hens.*—In this test two lots of hens were kept in confinement and all sunlight except that which passed through ordinary window glass excluded; two other lots were confined but had the run of a screened porch; and two other lots were on the open range. One lot in each pair received 2 per cent of cod-liver oil. The pH value of the whole whites and yolks of 982 eggs were only slightly higher in lots receiving cod-liver oil than in lots receiving no supplement. The percentage of calcium, inorganic phosphorus, and iron was significantly higher, while the percentage of ash in the yolks was practically the same in the lots receiving cod-liver oil as in the lots not receiving it. The percentage of ash, calcium, and acid-soluble inorganic phosphorus was lowest in the confined groups and highest in the groups on open range. The pH value of the whites was lowest in the confined lots, and the pH value of the yolks was lowest in the lots on open range.

*Vitamin D studies with chickens.*—Pullets were divided into three groups of two lots each. Lots 1 and 2 were confined, lots 3 and 4 were permitted to run on a screened porch, and lots 5 and 6 were allowed yard range. Lots 2, 4, and 6 received 2 per cent of cod-liver oil in addition to the basal ration. The cod-liver oil was effective in increasing both the winter and 10 months' egg production of pullets, regardless of the system of housing. Cod-liver oil did not increase the fertility of the eggs, although the hatchability of fertile eggs was increased when it was added to the ration of the confined pullets and the pullets on yard range.

*Effects of outcrossing on egg production.*—Outcrossing with White Leghorns resulted in an increase in the number of daughters laying 200 or more eggs and in average egg production. With Barred Rocks, however, the widest outcross did not bring about any improvement. The results indicated that the advantages of outcrossing were more than offset unless the unrelated male came from a strain that had long been bred and selected for the characteristics already established in the flock.

**The duration of the effect of winter sunlight on bone formation in the chicken, W. C. Russell and C. H. Howard** (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 493–496, figs. 2*).—In this study at the New Jersey Experiment Stations, three lots of chicks were fed a ration consisting of 99 per cent of yellow corn and 1 per cent of salt and liquid skim milk, both feeds fed ad libitum for about 7.5 weeks. Lot 1 was exposed for 1 day (February 19) when 11 days old to sunlight through Cel-O-Glass. Lot 2 was exposed for 2 bright, sunshiny days (February 19 and 20) and 1 partly cloudy day (February 21), while lot 3 was not exposed to sunlight. After the exposure period the chicks were kept in pens where they received only sunlight which had passed through window glass. During the course of the test and at the end of the period, analyses were made of the pooled bones of 8 or 10 individual birds from each lot.

The test showed that 1 day's exposure to winter sunshine transmitted through Cel-O-Glass resulted in a duration of effect on bone formation and delayed the onset of leg weakness. A 3-day exposure resulted in a longer duration of effect on bone formation and still further delayed the onset of leg weakness.

**The winter-time management of the laying flock,** W. C. Thompson (*New Jersey Stas. Circ. 249 (1931), pp. 32, figs. 32*).—This is a revision of Circular 145 (E. S. R., 48, p. 574).

**Artificial heat in poultry houses,** C. G. Card (*Michigan Sta. Rpt. 1930, pp. 228, 229*).—A study was made of the use of artificial heat for increasing winter egg production of pullets. Single Comb White Leghorn pullets were divided into 6 lots of 90 birds each. In 3 of the pens 1-in. pipes were placed 30 in. apart in the concrete floor, and hot water at 100° F. was forced through these pipes, keeping the floor at about 60°. This method of heating kept the litter dry, so that it could be used in the pen as long as it remained unbroken. The second method of applying heat was by an electric fan placed above the dropping board, which drove the air past electric heating elements. One pen was held at 35° and another at 45°. While the egg production in the second pen was somewhat larger than in the pen maintained at 35°, the difference was not great enough to warrant the extra expenditure for electric power.

**A practical poultry breeding improvement program,** W. C. Thompson (*New Jersey Stas. Bul. 527 (1931), pp. 16, figs. 7*).—A system for the improvement of poultry flocks under practical conditions is suggested. This depends upon the separation of pullets according to age and development, trap nesting of pullets, and "blue-banding" those pullets which in December and April give external indications of production capacity, and the selection of breeding males from high-producing hens, also taking into consideration their individual characteristics as to health and general qualifications. In following this system only eggs which weigh 26 oz. or more to the dozen should be placed in the incubator. Suggestions are also given for a full and descriptive designation of possible future breeders.

**Further studies on the wool production of Angora rabbits,** J. N. Pickard (*Harper Adams Util. Poultry Jour., 15 (1929–30), No. 7, pp. 338–342, fig. 1*).—Continuing these studies (E. S. R., 60, p. 567) at the University of Edinburgh, it was found that age apparently did not affect the wool production of Angora bucks up to 3 years of age. With the does, however, an increase was noted during the third year which was attributed to the coarsening of the fibers. No significant difference was found in the wool production of the sexes. The heaviest wool production during the year took place during the months of September to January, inclusive, and the lightest production from March to July.

## DAIRY FARMING—DAIRYING

**The production of dairy cows as affected by frequency and regularity of milking and feeding,** T. E. Woodward (*U. S. Dept. Agr. Circ. 180 (1931), pp. 16, figs. 3*).—Experiments were conducted to obtain information as to how much more milk was produced when cows were milked more than twice a day than with twice a day milkings. Other factors studied were the effect of changes in milkers and of milking and feeding at regular and irregular hours.

The results showed that milking cows three times a day in alternate 30-day periods, with 10-day transition periods, increased the milk production 11 per cent and the fat production nearly 10 per cent over milking twice daily. Over long periods of from 217 days to a year, cows milked three times daily produced approximately 20 per cent more milk and 21 per cent more fat. The cows milked twice daily showed the greater decline in milk yield over the long periods. Milking once a day caused production to decline 1.8 times as fast as milking twice a day. A comparison of milking three and four times a day showed 7 per cent more milk and 6 per cent more fat when milking was done four times daily. It was believed that the more frequent milkings increased production by relieving pressure in the udder and allowing secretion to proceed more freely.

Changing milkers resulted in an almost negligible decrease in milk production. Milking at regular instead of irregular hours caused an increase of 0.9 per cent in milk and a decrease of 1.2 per cent in fat production in one test, and an increase of 1.5 per cent in milk and a decrease of 2.6 per cent in fat production in a second test. Milking and feeding regularly increased milk and fat production 3.9 and 5.2 per cent, respectively, as compared with irregular milking and feeding. In one test cows were milked at regular 8-hour intervals and then at 6-, 7-, and 11-hour intervals for 30-day periods, following 10-day transition periods, and the milking at irregular intervals decreased the milk and fat production 2.9 and 2.8 per cent, respectively.

**Relationship between form and milk production of dairy cattle,** E. L. ANTHONY (*Michigan Sta. Rpt. 1930, pp. 200, 201*).—A study of the fat production of 463 Guernsey prize winners at the National Dairy Show from 1913 to 1922 showed that the average production of first-prize animals of all classes was 729 lbs. of fat; second prize, 648 lbs. of fat; third prize, 651 lbs.; fourth prize, 637 lbs.; fifth prize, 638 lbs.; and sixth prize, 568 lbs. of fat. These results indicate some correlation of form to function.

**Sterility and breeding problems in dairy cattle** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 12, 13*).—In a group of 16 aged cows the average number of services per pregnancy during 1928–29 was 3.56. For 14 of these cows the average was 1.64 services per pregnancy. In a group of 25 heifers the average number of services per conception with first calf was 3.4, and a similar number of services was required in another group of 15 heifers. In the above-named group of 25 heifers, the average age at first service was 18 months, and the average at the beginning of pregnancy was 22.76 months. Using an average of 6 or 7 calves and 60 or 70 months' milk production as the useful life of a cow, the delayed conception in this group of heifers represented a loss of approximately 2 cows.

**Clarification vs. filtration of milk,** D. H. JACOBSEN and T. M. OLSON (*South Dakota Sta. Bul. 257 (1931), pp. 13, fig. 1*).—Concluding this study (E. S. R., 61, p. 67), clarification of milk was found to increase the bacterial plate counts 134.5 per cent at 60° F., 36.1 per cent at 90°, and 20 per cent at 110°. Direct microscopic examination indicated that the increases were due to the breaking up of bacterial clumps. The increased bacterial counts and the more rapid reduction by methylene blue in clarified milk indicated that the process impaired slightly the keeping qualities of the milk. Filtration did not cause a uniform change, and its effect on keeping quality as indicated by bacterial counts and methylene blue reduction time was hardly noticeable.

While both methods removed all visible sediment in milk, the clarifier was more efficient in this respect than the filter. Clarification reduced the cream volume more at all temperatures studied than did filtration. At 60° filtration had no appreciable effect on cream volume, but at 90° there was a definite decrease. At 110° either process reduced cream volume and caused a less distinct cream line.

Clarification removed a greater percentage of cells in milk than did filtration, as well as more material. The material removed by the clarifier averaged about 60 per cent of protein, 8 per cent of fat, and 10 per cent of ash, while that removed by the filter averaged about 8 per cent of protein and 50 per cent of fat. The nutrient material removed by either process was of no commercial importance. The filter required less time for operation and cleaning than the clarifier.

**Efficiency of surface milk coolers tested,** G. M. Trout (*Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 6–9*).—Tests were made to determine the efficiency and water requirements of 5 surface-type coolers, (1) conical straight sided, (2) spiral tubular, (3) submerged hollow cylinder, (4) large horizontal tubes open, and (5) small horizontal tubes closed. In types 2, 4, and 5, the counterflow water system was used, and a water meter was attached to all coolers. Milk in 10-gal. lots was poured over each cooler in each test, and an initial and final temperature of each lot of milk was reported.

In the types using the counterflow water system, all yielded a milk with a final temperature below 60° F., averaging 58°. The average water requirement per gallon of milk necessary to secure this temperature was 7.1 gal. The range in time of cooling with the types studied was from 6 to 12 minutes. Coolers 4 and 5 had a cooling capacity of 1.66 gal. of milk per minute when a normal flow of water was used. Surface coolers materially shortened the time required to cool milk, but their efficiency depended upon the course of the cooling medium flowing through them, upon the rate of milk flow, and upon the rapidity of the milk itself in passing over the cooling area. It required as much water to cool milk with surface coolers as when the tank method was used.

**A study of methods for cleaning milking machines,** E. H. Parfitt (*Indiana Sta. Bul. 348 (1931), pp. 24, figs. 13*).—Concluding this study (E. S. R., 65, p. 172), it was found that milking machines could be kept in a satisfactory bacteriological condition during the summer with a minimum amount of work by (1) immediately at the conclusion of milking, rinsing with cold water. When suction is used the teat cup should be doused to procure an air brush. (2) Following the cold rinse with hot water (165° F., 1.5 gal. per unit), and when suction was used the teat cups were not doused, and (3) placing the teat cups and long milk tubes on a rack and filling with a disinfectant solution. This solution is drained just before milking and cold water drawn through the machine to remove possible traces.

A study of disinfectant solutions showed that sodium hypochlorites and chloramine-Ts were satisfactory when used at strengths of not less than 200 parts of available chlorine per million. However, chlorine solutions caused an unsightly precipitation in the rubber tubes. A dilute solution of lye (from 0.3 to 0.5 per cent) was a satisfactory disinfectant for rubber tubes and did not cause a precipitant.

Rinsing milking machines first with cold and hot water and then just before milking with hot water and then cold water gave the lowest degree of contamination. When milking machines were rinsed by suction, the head of the machine was a source of contamination but not sufficient to reduce materially the quality of the milk.

Appended are directions for washing and disinfecting milking machines.

**Sterilizing dairy utensils on the farm,** D. R. Theophilus and F. W. Atkeson (*Idaho Sta. Bul. 183 (1931), pp. 28, figs. 10*).—This study was undertaken to obtain information on the sterilizing problems of the small producer of milk and cream. The investigation included data on seven commercially manufactured combination sterilizers and water heaters, one water heater, and one homemade sterilizer. Electricity, gas, gasoline, and kerosene were used in different sterilizers as sources of heat. Each sterilizer was studied from two viewpoints, (1) as a means of sterilizing, and (2) as a means of heating water for washing purposes. In the first phase a 10-gal. can was washed but not sterilized, then rinsed with 200 cc. of sterile water, and the bacterial count of this water was determined. After sterilizing the can, it was again checked for bacterial contamination, and the sterilizing efficiency expressed as the percentage of bacteria destroyed. In this phase of the study the utensils were held in the sterilizers for varying periods. In the second phase 70 lbs. of water were heated from an average of 53 to 140° F.

All of the sterilizers tested proved to be efficient in sterilization when operated correctly. The cabinet or steam box types were most efficient for all types of utensils, but were limited in capacity. The steam jet sterilizers, while not limited in capacity, were not well adapted to sterilizing strainers, separator parts, and other small utensils. A combination of the cabinet and open jet had the widest adaptation. Chemical sterilization is suggested as an alternative method or as a supplement to steam sterilization.

Electricity was the most convenient, cleanest, freest from odors, and had the least fire hazard of the types of fuel used, but was the most expensive. Compressed natural gas was cheaper and quicker in operation than electricity and ranked next to it in the factors mentioned above. Gasoline and kerosene were the cheapest sources of fuel, but produced objectionable fumes, made the sterilizers harder to clean, and represented greater fire hazards. Gasoline proved to be superior to kerosene.

**Bacteriology of butter.—III, A method for studying the contamination from churns**, B. W. Hammer and H. C. Olson (*Iowa Sta. Research Bul. 141* (*1931*), *pp. 225–248, figs. 20*).—Continuing this series of studies (E. S. R., 65, p. 667), a method for studying the contamination from churns was worked out. This method consisted of allowing a small amount of an agar medium containing 2.5 per cent of air-dried agar to solidify in contact with the surface to be studied, transferring the solidified agar to a sterile Petri dish, and counting the colonies that develop on incubation. When the surface to be studied was nearly horizontal the agar was poured on, while with surfaces not horizontal the agar was poured behind a glass plate held a short distance from the surface by means of a gasket.

This method gives a general picture of the churn surface, requires comparatively little equipment, and the agar preparation shows the irregularities of the surface covered. The method can be used for studying yeasts and molds in churns by a slight change in the medium. It has also been used for the examination of pails, cans, weigh vats, cooler troughs, and ice cream freezers.

**Test effect of starter on keeping quality of butter**, P. S. Lucas, C. D. Ball, R. E. Vincent, and G. M. Trout (*Michigan Sta. Quart. Bul.*, *14* (*1931*), *No. 1, pp. 38–41*).—In this study lots of sweet cream were divided into five parts. One part was churned sweet; the second was churned sweet, but 3 per cent of its fat weight was added with the salt in the form of starter; the third part was churned after 3 per cent of the cream's weight in the form of starter was added just before churning; the fourth part was ripened to from 0.3 to 0.35 per cent acidity and churned; and the fifth part was ripened to from 0.45 to 0.52 per cent acidity and churned. The samples were churned under identical conditions, and samples of the butter were stored at 0° F. and used for scoring and chemical analyses after storage for 1 day, 1 week, 1 month, 3 months, and 6 months.

The working of the starter into the butter had practically no effect on curd content, and the latter had no effect on deterioration of quality. The amino nitrogen content fluctuated in the different samples, but the differences were so small that they were of no consequence. The nitrogen content of sweet cream butter was slightly lower than that of ripened cream butter and appeared to increase somewhat after storage for 3 months. The Reichert-Meissl test and the iodine number showed no relationship to the use of starter, and the Kreis test alone showed any relationship to score.

The average score of the butter after 1 day of storage showed that the lots ranked in the following order: 4, 3, 2, 5, and 1. After 30 days' storage the rankings for score had changed to 3, 2, 4, 1, and 5, and at the end of 3 months to 3, 2, 1, 4, and 5. At the end of 3 months many of the samples from the ripened cream had developed a slight fishy flavor, and by the end of 6 months practically all showed this defect.

In another test similar samples were sent to the Chicago market for scoring when fresh and after 30 and 180 days of storage. The tendency of these samples to deteriorate during storage approximated very closely the above discussed samples.

**Effects of physical curd character of milk on the quality, yield, and physical texture of cheese, R. L. Hill and A. C. Merrill** (*Utah Sta. Circ. 95 (1931), p. 9*).—Results obtained in this study indicated that soft-curded cheese needed more color to get the intensity required by the market; soft-curded cheese cured faster; hard-curded cheese had a better body and texture, the soft-curded cheese being brittle and soft and having a tendency to break under the slightest strain; the flavor of hard-curded cheese was more delicate and pleasing; and the finish of hard-curded cheese was firmer and freer from curd cuts.

**Some factors affecting the viscosity of cream, C. J. Babcock** (*U. S. Dept. Agr., Tech. Bul. 249 (1931), pp. 20, pls. 21, figs. 10*).—This study was made to determine some of the causes for variations in the body of cream. The viscosity of the cream was measured by an instrument similar to the standard Saybolt viscometer, and the time required to discharge the first 60 cc. of the 70 cc. of liquid capacity of the instrument was measured in seconds. The viscosity results in nearly every case represented the average of at least 25 determinations. For microscopic study the cream was diluted 1 part to 100 with a solution composed of 1.5 parts of gelatin dissolved in 100 parts of water, to which was added 1 per cent of phenol.

Factors affecting the fat phase of cream were of more importance in influencing viscosity than those affecting other phases. The viscosity of cream was found to increase as the butterfat content increased and as the temperature was lowered. While pasteurization lowered the viscosity, the temperature had but little effect. Viscosity of pasteurized cream increased with age, but not to the same extent as raw cream. The greatest increase in viscosity of both raw and pasteurized cream occurred during the first 24 hours and reached its maximum in 48 hours. The increase in viscosity with age was accompanied by an increase in the clumping of fat globules. Gravity-separated cream had a higher viscosity than centrifugally separated cream, and the lower the temperature of separating the higher was the viscosity. Standardizing cream had practically no effect on viscosity, and acidity, except when in an excess of 0.3 per cent, had but little effect. Homogenization caused an initial increase in viscosity, the increase being in direct relation to the homogenizing pressure and temperature, but aging produced no further increase in this viscosity. Rehomogenization lowered the viscosity of the cream.

Cooling raw or pasteurized cream slowly produced a higher viscosity than when the cream was cooled rapidly. Freezing cream lowered its viscosity, and this character was not restored by aging the thawed cream. Storing milk at 4° C. before separating increased the viscosity of the resultant cream more than storing at 18°, and 12 hours' storage resulted in a higher viscosity than 3 hours' storage. Cream from milk pasteurized before separating had a lower viscosity than cream separated and then pasteurized, unless the pasteurized milk was cooled slowly before separating. As the percentage of solids-not-fat in cream increased, the viscosity increased, and this was especially true with homogenized cream.

**Effect of heat treatment upon the quality of dry skim milk and condensed skim milk for ice cream,** O. E. WILLIAMS and S. A. HALL (*U. S. Dept. Agr. Circ. 179 (1931), pp. 11, figs. 3*).—This work was undertaken to determine whether there was a difference in quality of ice creams containing different types and forms of dry skim milk and ice creams containing the better form of spray-dried skim milk and unsweetened condensed milk when representing over 80 per cent of the serum solids. Spray-dried skim milk preheated to 63° C., preheated to 83°, and drum-dried skim milk, and condensed skim milk superheated and condensed skim milk preheated at 63 and 83° were used in the study. The sales-preference method was used for determining the most desirable flavor and texture of the ice creams.

The results showed that various milk solids-not-fat used in the manufacture of ice cream differed in their ability to impart desirable properties to ice cream. The spray-dried skim milk, preheated to 83°, was the most beneficial of the dried skim milks used and a better ingredient for ice cream than three forms of unsweetened condensed milks studied. Superheated condensed skim milk improved the quality of ice cream more than when not superheated or when preheated at 83°, but was not as valuable for this purpose as spray-dried skim milk preheated at 83°.

## VETERINARY MEDICINE

**[Work in animal pathology at the Kentucky Station]** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 12, 13–15*).—In a study of acidosis of pregnant ewes, 13 were maintained on a ration of timothy hay and corn in an attempt to produce it, but with negative results. Examinations, however, showed that there was a change in the blood approaching that found in actual cases of the disease. Of 4 cases of pregnant ewes on which post-mortem examinations were made the first had a vascular tumor of the pituitary, the second a hemorrhagic pituitary, the third a hemorrhagic pituitary and extensive calcification of the thyroid, and the fourth a normal pituitary and thyroid.

A study was made of the variation in *B[acterium] viscosum equi*, which when isolated from infective material from young foals usually produces rough, mucoid colonies. "Under the conditions of artificial cultivation, these change to smooth, nonmucoid forms which bear no resemblance in cultural characters to the rough, mucoid cultures, although their biochemical and serological characters remain unchanged. Smooth, nonmucoid races of the bacterium occasionally are isolated directly from infected foals, and their recognition is of importance in the diagnosis of the disease. A second form of variation noted in this species is the production of dwarf variants. These variants, which are greatly restricted in their form of growth, are similar morphologically and biochemically to normal strains of the bacterium. In certain instances, it has been possible to demonstrate the antigenic identity of dwarf variants and normal strains. The dwarf variants, which ordinarily produce small, streptococcus-like colonies, can be stimulated by the addition to the medium of certain substances such as blood serum or cabbage juice so that they produce colonies comparable in size to those produced by normal strains. These dwarf variants have been isolated directly from normal foals and from stock culture of *B. viscosum equi.*"

In studying the resistance of *B. abortus*, it was found that the organism remained viable on grass in a pasture upon which agar cultures had been sprayed in February for 6 days but not for as long as 10 days under the conditions prevailing, which included 0.6 in. of rain and 0.05 in. of snow with a temperature range of from 10 to 70° F. In a similar experiment conducted in May in sunny weather with a temperature of from 60 to 81° the organism was not recovered after 24 hours. In an experiment in November, the organism remained viable on the grass for 5 days but was not recovered on the sixth and seventh days, the temperature having ranged from 36 to 70° during this period. In bits of an agar plate culture placed on the ground under tall grass in sunny weather in June, the organism lost its viability after 2 days. Plate cultures exposed, uncovered, on the ground in sunny weather in October and November retained viability for from 3 to 5 days. The 40 strains of *B. abortus* from individual organisms studied were found to differ little in morphological, physiological, and serological characters from the cultures from which they were obtained.

Two of 3 pregnant sows that were given intravenous injections of living cultures of *B. abortus* recently isolated from aborted cows aborted, but the organism could not be recovered from the placenta or from the organs of the dead pigs. Blood serum from all 3 of the sows responded to the test for antigen of the bovine strain.

Vaccine prepared from *B. abortivo equinus* was administered to 2,167 mares on 69 farms. Only 7 of these mares aborted, and 2 of these were not attributed to the disease. *B. abortivo equinus* was isolated from the 2 fetuses of 2 mares that had been vaccinated only a short time before aborting, indicating that mares should be immunized before late fall or winter, so that immunity may be established early in the season.

**[Report of work in animal bacteriology and parasitology at the Michigan Station]**, W. Giltner (*Michigan Sta. Rpt. 1930, pp. 180–182, 183–188*).—Studies by I. F. Huddleson of Brucella infections of man and animals made in the Mediterranean countries during the year are briefly reported upon. He found no evidence that the disease in humans in Tunis and the Maltese Islands is caused by a species of Brucella other than *B. melitensis*. It was found that the disease in the goat in the Mediterranean countries differs from that in the cow in the United States in that it is of a more generalized nature and the symptom premature expulsion of the fetus, commonly associated with the disease in the cow, does not often occur. The rapid agglutination test was found to be as accurate and specific in the serum diagnosis of undulant fever in the Mediterranean countries as is the test tube method. The isolation of *B. melitensis* from human blood could be accomplished with much more ease and with a higher degree of success if a special medium such as beef or veal liver infusion bouillon was used for the purpose. It appears that the time interval between inoculation and initial growth of *B. melitensis* from blood is, on the average, about 72 hours, but, occasionally, 15 days of incubation are required for initial growth to occur. The pyretic period is the most favorable time for obtaining the organism in culture from the blood.

A brief report is made of work by D. B. Meyer on cooperative field experiments for the control of bovine infectious abortion by use of a nonvirulent vaccine to April 30, 1930.

Studies by J. P. Torrey of the effect of disease in the cow on the milk have shown that it is a comparatively simple matter to apply the rapid agglutination test to milk from each quarter of the cow's udder and to determine the presence or absence of *B. abortus* infection.

Further study of the value of colloidal iodine for the control of blackhead in turkeys by W. L. Chandler (E. S. R., 65, pp. 175, 772) indicates that the administration of a vermicidal dose of this drug materially aids in the control of the disease. Additional investigation of the possibility of developing a vermicidal iodine capsule for use in dosing poultry resulted in the production of an insoluble powdered colloidal iodine which gives off the iodine slowly by diffusion after swelling of the insoluble particles. Capsules loaded with this material have given a fair degree of efficiency in the removal of intestinal roundworms and tapeworms in chickens and turkeys and are apparently harmless.

Investigations of the parasiticidal value of orthophenylphenol and sodium orthophenylphenate by F. Young showed that while they exert no lethal action on parasitic worms, worm eggs, and coccidia, they do exert a powerful lethal action on certain ectoparasites. Poultry lice on feathers dusted with the powdered orthophenylphenol even when highly diluted with talc or fuller's earth very quickly drop off and are dead in from 5 to 10 minutes. Also sheep ticks when submerged in a 1 per cent soap-water solution of sodium orthophenylphenate and immediately removed die within 10 minutes. The results obtained in dusting birds with powdered orthophenylphenol both undiluted and diluted with talc, fuller's earth, or chalk up to 87 per cent are presented in tabular form. The results indicate that the orthophenylphenol remains effective on the bird for about 5 days, lice hatching from eggs after that period not being killed.

In cooperative experiments with J. M. Moore, Chandler found that the incorporation of 15 per cent powdered buttermilk in the daily feed gives a fair degree of control of coccidiosis. In order to determine the value of daily feeding of small amounts of colloidal iodine (4 mg. per bird per day), the birds in one of two pens kept on identical feed were administered iodine in their drinking water. The experiment was run for 7 weeks, at the end of which time the birds receiving the iodine averaged 33 per cent heavier than the birds on the same feed but without iodine and the death rate was a little less in the iodine pen. The fact that at the end of the experiment 9 birds in the iodine pen were considered worth keeping as compared to only 1 bird in the control pen is considered most significant.

In collaboration with G. A. Brown, tests were made of the value of carbon tetrachloride, oil of chenopodium, and various iodine preparations in the treatment of intestinal worms in sheep, none of which proved very effective when given in maximum doses. One of the principal facts definitely established in connection with the use of colloidal iodine is that, when administered to poultry in vermicidal doses (1 oz. containing 2 per cent $I_2$ and 4 per cent gum arabic delivered in the gizzard, in addition to being efficient against both roundworms and tapeworms it does not affect egg production.

**[Reports of the New York State Veterinary College at Cornell University for the years 1928–29 and 1929–30]** (*N. Y. State Vet. Col. Rpts. 1928–29, pp. 154, figs. 3; 1929–30, pp. 184, pls. 4*).—Reports of clinics and research presented in the appendix to the 1928–29 report (E. S. R., 62, p. 260) for the year ended June 30, 1929, deals with the ambulatory clinic, by D. H. Udall, M. G. Fincher, and W. J. Gibbons (pp. 31–34); the surgical and consulting clinics, by J. N. Frost and J. Maurer (pp. 35–37); the small animal clinic, by H. J. Milks and H. C. Stephenson (pp. 38–40); the diagnostic laboratory, by D. W. Baker and R. C. Klussendorf (pp. 41–43); autopsies, by P. Olafson (pp. 44, 45); the diagnostic work on poultry diseases at Ithaca, by E. L. Brunett (pp. 46–48); and the poultry disease laboratory at Farmingdale, Long Island, by J. M. Hendrickson and K. F. Hilbert (pp. 49–53). The following papers are included: Answers to Questions regarding Bang Abortion Disease in Cattle, by R. R. Birch (pp. 54–60); Bacterial Flora of the Bovine Pregnant Uterus, by A. G. Gierke (pp. 61–74); Subcutaneous Lesions Which Sometimes Induce Tuberculin Hypersensitiveness in Cattle, by W. A. Hagan (pp. 75–82); Some of the More Recent Remedies, by H. J. Milks (pp. 83–89); Breeding Principles and Blood Test in the Control of Bang Abortion Disease, by D. H. Udall (pp. 90–97); Transmission of *Bacterium pullorum* infection among Mature Chickens, by E. L. Brunett (pp. 98–110) (E. S. R., 63, p. 776); The Significance of *Brucella abortus* Agglutinins in Human Serum, by C. M. Carpenter, R. Boak, and O. D. Chapman (pp. 111–125); The Effect of an Alternating Electric Current on Tubercle Bacilli in Milk, by C. M. Carpenter (pp. 126–134); A Study of the Influence of *Bact*[*erium*] *pullorum* Infection upon Some Organic and Inorganic Constituents of the Blood of S. C. White Leghorns, by C. E. Hayden and E. L. Brunett (pp. 135–142); and Sugar, Guanidine, and Cholesterol in the Blood of the Cow in Milk Fever, by C. E. Hayden (pp. 143–152) (E. S. R., 62, p. 264).

The reports of clinics and research presented for the year ended June 30, 1930, deal with the ambulatory clinic, by D. H. Udall, M. G. Fincher, W. J. Gibbons, and S. D. Johnson (pp. 33–36); the surgical and consulting clinics, by J. N. Frost and J. Maurer (pp. 37–39); the small animal clinic, by H. J. Milks, H. C. Stephenson, and G. W. Cangi (pp. 40–42); autopsies, by P. Olafson (pp. 43, 44); the Diagnostic Laboratory, by D. W. Baker and R. C. Klussendorf (pp. 45–47); the diagnostic work on poultry diseases at Ithaca, by E. L. Brunett (pp. 48–50); and the poultry disease laboratory at Farmingdale, Long Island, by J. M. Hendrickson and K. F. Hilbert (pp. 51–55). The following articles are given: The Agglutination Test in Relation to the Persistence of *Bact. abortus* in the Body of the Cow, by R. R. Birch and H. L. Gilman (pp. 56–88); Paratyphoid Infection of Pigeons, by E. L. Brunett (pp. 89–93) (E. S. R., 63, p. 776); Experiments on Hog Cholera and Dog Distemper, by J. W. Benner (pp. 94–104) (E. S. R., 65, p. 269); Pullorum Disease in the Mature Turkey, by E. L. Brunett (pp. 105–108) (E. S. R., 64, p. 565); *Bact. abortus* Infection in the Fowl, by H. L. Gilman and E. L. Brunett (pp. 109–113) (E. S. R., 64, p. 562); Transmission of *Bacterium pullorum* Infection amond Mature Chickens, II, by E. L. Brunett (pp. 114–116); Diseases of the Perineum, by H. J. Milks (pp. 117–123); Studies on the Cellular Changes in Pigs' Blood during the Development of Hog Cholera, by S. Shu (pp. 124–136); Pyometra in Bitches, by H. Stephenson (pp. 137–141); The Elimination of *Bact. abortus* in the Milk of Cows, by H. L. Gilman (pp. 142–156) (E. S. R., 63, p. 772); Bang Abortion Disease in Relation to Interherd Transfer of Cattle, by R. R. Birch (pp. 157–166) (E. S. R., 63, p. 773); Experiments on Attenuating Hog Cholera Virus with Chloroform, by S. Shu (pp. 167–173); and A Study of Some Organic and Inorganic Constituents of the Wing and Throat Blood of Laying and Non-Laying Rhode Island Red Hens, by C. E. Hayden and J. Sampson (pp. 174–182).

**Report of the Veterinary Department, Burma (including the Insein Veterinary College), for the year ended the 31st March, 1930,** D. T.

Mitchell (*Burma Vet. Dept. Rpt. 1930, pp. [3]+2+4+49, pls. 3*).—Included in this report are sections on administration, contagious diseases in the districts, the incidence of contagious diseases in the stock of the Province during the year, measures for the control of contagious diseases of animals, noncontagious diseases, etc.

**Anthelmintic tests of chlorinated alkyl hydrocarbons and a correlation between the anthelmintic efficacy and the chemical composition,** W. H. Wright and J. M. Schaffer (*Jour. Parasitol., 16 (1929), No. 2, pp. 107, 108*).—In critical tests of 17 different compounds ranging in carbon content from two to six atoms in the alkyl group and containing one to five chlorine atoms, new and promising anthelmintics were found. Among the most efficacious and at the same time apparently the least toxic of these compounds were N-butyl chloride, 98 per cent effective for ascarids and 82 per cent effective for hookworms; 2-chlorpentane, 82 per cent effective for ascarids and 93 per cent effective for hookworms; 3-chlorpentane, 60 per cent effective for ascarids and 94 per cent effective for hookworms; and N-butylidene chloride, 100 per cent effective for ascarids and 95 per cent effective for hookworms. The compounds were administered to dogs in doses of 0.1 to 0.5 cc. per kilogram of body weight, and the percentages reported are based on the total number of parasites removed by the drug in the several dosages used, as compared with the number originally present in the dogs treated. There appeared to be a direct correlation between the anthelmintic efficacy and the solubility of the compounds tested. The most soluble as well as the least soluble compounds were usually the least effective.

**The use of liquor folliculi in obstetric veterinarian practice,** G. Pighini and S. Rivabella (*Endocrinology, 15 (1931), No. 3, pp. 195–204*).—The authors conclude that treatment with the estrofollicolina is a valuable means in obstetric veterinarian practice, especially for cases of endouterine inflammatory processes, to combat which the most rational therapeutic means often have hitherto been ineffective.

**A critical study of the Brucella agglutination reaction and abortion rate in a herd of cattle under natural conditions,** I. F. Huddleson and L. H. Smith (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 1, pp. 63–78; abs. in Michigan Sta. Quart. Bul., 14 (1931), No. 1, pp. 52, 53*).—In this contribution from the Michigan Experiment Station and the Detroit Creamery Farms at Mount Clemens, Mich., cooperating, compiled records of the serological tests and abortions occurring in a total of 541 animals from 1923 up to the time of writing are presented, the details being given in tabular form.

**Further studies of the test-tube agglutination test for the diagnosis of Bang's disease (contagious abortion),** C. P. Fitch, C. R. Donham, and W. L. Boyd (*Minnesota Sta. Tech. Bul. 77 (1931), pp. 69*).—This contribution on the agglutination test for the diagnosis of infectious abortion reports upon studies conducted in continuation of those previously noted (E. S. R., 65, p. 177).

"The titers of agglutinating sera were not appreciably influenced by a broad zone in pH values of *Bact[erium] abortus* antigens, such variation in pH resulting from the addition of dilute solutions of HCl and NaOH to the antigen. The reactions of agglutination sera were not appreciably altered when tested with *B. abortus* antigens having concentrations of NaCl between approximately 0.25 and 8 per cent. The rate of agglutination usually increases as the temperature rises up to an optimum of 55° C. Some slow agglutinating sera are encountered in all of the ranges of agglutinin content of sera. With such sera, increasing the temperature of incubation of tests can not be substituted for the 48 to 72 hour time element necessary for attaining the maximum agglutination titers.

"A precipitate ('false agglutination') was observed in incubated tests of hemolyzed sera with antigens containing 0.5 per cent phenol or 0.1 per cent cresol. The 'true agglutination' titer of some low agglutinin content sera was masked in incubated tests when such sera containing hemoglobin were tested with such antigens. Room temperature is more satisfactory than incubation temperatures for holding agglutination tests of hemolyzed bovine sera with antigens containing 0.5 per cent phenol or 0.1 per cent cresol. Fresh unpreserved antigens and those preserved with 0.25 per cent formalin are more satisfactory than antigens preserved with 0.5 per cent phenol or 0.1 per cent cresol for incubated tests of hemolyzed bovine sera for the diagnosis of Bang's disease. This advantage is, however, overshadowed by disadvantages of such antigens. It appears that workers using *B. abortus* antigens preserved with 0.5 per cent phenol or 0.1 per cent cresol must choose between the disadvantages of incubating agglutination tests of bovine sera, some of which contain hemoglobin, and the disadvantage of delaying the results until the third day, when holding the agglutination tests at room temperature.

"The temperature that interfered with the activity of *B. abortus* agglutinin in bovine serum varied somewhat in different sera. In some sera the agglutinin was partially destroyed by heating at 58° for 1 hour. The incubation of agglutination tests of bovine sera at 55° is a satisfactory procedure providing the thermoregulating mechanism of the water bath is sufficiently accurate to prevent the temperature of the bath reaching approximately 58° at any time."

Two methods, (1) holding the tubes in the hands and shaking, and (2) observing the tubes in racks of observation of agglutination tests with 1 ml. and 2 ml. amounts on antigen, were compared. There was no preference in these two methods from the standpoint of uniformity of the results of observation of agglutination. Shaking of agglutination tests (in shaking machines) for the diagnosis of Bang's disease was not successful as a means of hastening the agglutination reaction to a point that would permit immediate final observation of the tests. The sensitivity of antigens prepared from cultures transferred on horse serum agar, glycerin agar, and liver infusion agar for approximately 8 months was not appreciably altered. Refrigerator temperatures were found to be decidedly advantageous for storing bovine serum as compared to room temperature. Removal of the clear serum from the coagulated blood and storing it in clean sterile test tubes was decidedly advantageous as compared to holding the serum on the clot.

**Johne's disease (paratuberculosis), I, II,** E. Lash and W. M. Mohler (*Jersey Bul. and Dairy World, 50 (1931), Nos. 27, pp. 1135, 1136; 28, pp. 1176, 1196, 1197*).—This is a practical account.

**Studies in the variability of tubercle bacilli.—I, A rapid-growing bovine type,** G. B. Reed and C. E. Rice (*Canad. Jour. Research, 4 (1931), No. 4, pp. 389–398, pls. 3*).—This rapid-growing strain of the bovine tubercle bacillus was detected in the course of variability studies on a considerable series of cultures of tubercle bacilli and related species of acid-fast bacteria. "It is shown that this avirulent, rapid-growing strain consists of R types which appear to be stable in acid fluid media and more or less stable on solid media. Rapid transfers through strongly alkaline fluids or growth in large volumes of similar media result in appreciable dissociation into S types. The S types were unstable, particularly in acid fluid media, and readily reverted to the R form."

**Urinary calculi in sheep.—A progress report,** B. E. PONTIUS, R. H. CARR, and L. P. DOYLE (*Amer. Soc. Anim. Prod. Proc. 1930, pp. 185–190, figs. 2*).—A more detailed account of the studies here reported has been noted from another source (E. S. R., 65, p. 379).

**The blood pressure of the pig and the influence of non-nervous and nervous factors on the cardiovascular apparatus,** H. H. DUKES and L. H. SCHWARTE (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 1, pp. 37–62, figs. 21*).—The authors found the mean blood pressure in the ligated carotid artery of the 14 pigs under local anesthesia to average 169 mm. Hg.

**Experiments to determine the effect of sodium hydroxid and calcium hydroxid on the virus of hog cholera,** C. N. MCBRYDE, W. B. NILES, and C. G. COLE (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 1, pp. 87–89*).—The authors' tests, the details of which are presented in tabular form, show quite clearly that 3 per cent sodium hydroxide in combination with 2 per cent milk of lime is effective in destroying the virus of hog cholera in virulent blood within 15 minutes.

**N-butylidene chloride, a new drug for the treatment of equine strongylidosis,** W. H. WRIGHT, H. B. RAFFENSPERGER, J. BOZICEVICH, P. C. UNDERWOOD, and J. M. SCHAFFER (*Jour. Agr. Research [U. S.] 43 (1931), No. 4, pp. 287–302*).—The work of Wright and Schaffer, noted on page 175, led to the testing of this drug as a treatment for strongylidosis in the horse with a view to displacing chenopodium, the drug most frequently used but which has been objected to because of its toxicity.

In the experiments conducted, the details of which are presented, N-butylidene chloride was found when administered to 4 animals at a dose rate of 0.207 to 0.333 cc. per kilogram of body weight and followed in 5 hours by 960 cc. of raw linseed oil for a 1,000-lb. animal to be efficacious in 50, 94, 100, and 100 per cent, respectively, against *Strongylus* spp. and in 100 per cent in all 4 animals for cylicostomes.

"In other tests the efficacy of N-butylidene chloride for the above-mentioned parasites was considerably lowered where the drug was administered in raw linseed oil or where it was followed by aloes or by a castor oil-mineral oil mixture. When administered in raw linseed oil, N-butylidene chloride was relatively ineffective for the removal of ascarids, but when given without oil the drug was apparently effective for the removal of this species. N-butylidene chloride, administered to 3 animals weighing from 800 to 1,200 lbs., in doses of 60 cc. in capsules, failed to destroy one *Habronema muscae* in 1 animal; was 55.5 per cent effective for this species in a second animal; and was 97.2 per cent effective for *H. microstoma* in a third animal. It seems probable that a preliminary gastric lavage would add to the efficacy of N-butylidene chloride against *Habronema* spp. The drug was relatively ineffective against bots. Species of parasites other than those mentioned above were not present in sufficient numbers to warrant final conclusions.

"N-butylidene chloride was well tolerated and produced no gross pathological alterations. Microscopical pathology in the livers of treated animals was confined to cloudy swelling with some fatty degeneration but no central necrosis. In two of three animals the drug produced only a hyperemia of the kidneys, but in the third animal cloudy swelling and degeneration of the tubular epithelium were present. The severity of the lesions in this animal was apparently associated with increased absorption of the anthelmintic due to insufficient purgation."

**Poisoning in chickens with whorled milkweed,** H. W. CAMPBELL (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 1, pp. 102–104*).—This is a brief report upon the poisoning which resulted in a flock of 700 8-weeks-old pullets on a ranch in California from feeding upon narrow-leafed whorled milkweed (*Asclepias mexicana*), previously known to be poisonous to sheep, cattle, and goats.

**Demonstration of presence of fowl pox virus in wild caught mosquitoes (Culex pipiens)**, I. J. KLIGLER and M. ASCHNER (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, pp. 463–465*).—The authors have now obtained evidence (E. S. R., 62, p. 774) by feeding and inoculation experiments that *C. pipiens* taken in the vicinity of chickens infected with fowl pox harbor the virus. Spontaneous infections developed among healthy chickens kept in separate cages in the same room with infected ones, when the room was infested with this mosquito. Some of these mosquitoes, taken in the room where the infections occurred, as well as in a room outside but adjacent to the animal house, were shown to harbor fowl pox virus. Thus it appears that *C. pipiens* may serve in nature as an active agent in the spread of epidemics of fowl pox among chickens.

**Results of experiments with the use of pigeon-pox virus as cutaneous vaccine against fowl-pox**, E. P. JOHNSON (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 1, pp. 81–86, figs. 2*).—In studies at the Virginia Experiment Station pigeon box vaccine was found to be a very satisfactory immunizing agent for preventing natural infection with chicken pox. The product prepared was not 100 per cent efficient in immunizing against artificial infection. Pigeon pox virus vaccine seemed to have no ill effects upon the birds, nor was any decrease noted in egg production following its use.

**Accuracy of three cooperating laboratories in detecting pullorum disease by the agglutination test**, J. BIELY, C. E. SAWYER, C. M. HAMILTON, W. T. JOHNSON, and E. M. DICKINSON (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 1, pp. 19–36, figs. 2*).—This is a contribution from the University of British Columbia, the Western Washington Experiment Station, and the Oregon Experiment Station, cooperating, and reports the findings of the three laboratories in agglutination tests for the detection of pullorum disease.

"Fifteen negative and 15 positive reacting fowls were procured at random by each of the three laboratories, and all surviving were bled four times at 4-week intervals for cooperative agglutination testing for pullorum disease. Three blood samples were drawn from each fowl at each bleeding and tested at British Columbia, Washington, and Oregon laboratories, each applying its own technic. A total of 1,041 blood samples was tested and a diagnosis made for each—531 positives, 8 suspicious, and 502 negatives, or a disagreement of 0.77 per cent of the 1,041 diagnoses. The disagreements in agglutination test diagnoses among the laboratories were from negative or positive to suspicious and not negative to positive or the reverse. One fowl changed from negative to positive, but none changed from positive to negative.

"Post-mortem findings of the 46 positive reacting fowls definitely established *S* [*almonella*] *pullora* infection in 44 (95.65 per cent) and characteristic lesions in the other two indicated a probable 100 per cent *S. pullora* infection. Post-mortem findings of the 44 fowls which never gave a positive reaction were 100 per cent negative, as determined bacteriologically and by absence of *S. pullora* lesions. All three laboratories were in absolute accord in the 342 test diagnoses of the 15 positive and 15 negative reacting fowls of laboratory 3, and post-mortem examinations established the positive fowls infected and the negative fowls not infected, as determined by gross and bacteriological examinations."

**Avian coccidiosis**, R. E. REBRASSIER (*Ohio Sta. Spec. Circ. 34 [1931], pp. 7, figs. 2*).—A brief practical account of this disease and means for its control.

**The morphology and life history of the fowl nematode Ascaridia lineata (Schneider)**, J. E. ACKERT (*Parasitology, 23 (1931), No. 3, pp. 360–379, pls. 2, figs. 25*).—This is a contribution from the Kansas Experiment Station and the Molteno Institute for Research in Parasitology at the University of Cambridge.

Studies were made of the morphology, with special emphasis on the taxonomic characters, of 220 mature male and female *A. lineata* from chickens at Manhattan, Kans., and Cambridge, England. "Eggs arising in the anterior ovary pass into the posterior uterus; similarly, eggs from the posterior ovary pass into the anterior uterus. In young females eggs may be fertilized at any place in the uteri; in adults fertilization occurs near the distal ends of the uteri. With the aid of a micromanipulator, a small structure in one pole of the mature egg, previously described as an opening, an opercular plug in the shell, or as an internal thickening of the shell, was found to be a solid, conical appendage of the vitelline membrane, free from the shell. Fertilized eggs develop to the coiled embryo (infective) stage in 16 days when incubated in water at 30° C.; in 1 mm. of water at 33° they become infective in 10 days. Water cultures of fertile eggs do not develop when kept at constant temperatures of 0° or of 10°; at 15° development proceeds. Constant refrigeration of fertile eggs in water cultures for 1 month at 0° so lowers the vitality that, on being incubated subsequently at 30°, they divide slowly and soon die. Keeping the eggs at 10° for 1 month has no deleterious effect on them when incubated subsequently at 30°.

"In hatching, the embryo may escape from any part of the egg shell, either in the duodenum of the host or in water cultures. Newly hatched larvae swallowed by the chicken seldom become established. Infestations normally result from the ingestion of embryonated eggs. The habitat of *A. lineata* is the duodenum, especially the portion which is a few centimeters posterior to the entrance of the bile ducts. Determination of H-ion concentrations showed that the nematodes live in nearly neutral media (average 6.7). Penetration of the duodenal mucosa by larvae 10 to 17 days old is frequent in young chickens. Occasionally, a larva goes on through the intestinal wall to the liver and lungs, but ordinarily, after the seventeenth day the young worms withdraw from the mucosa into the lumen of the intestine. Young *A. lineata* grew to maturity in 50 days in chickens parasitized when about a month old. In six 8-day periods following hatching of the larvae the average daily growth in length per period was about 0.12 mm. in the first period, 0.75 mm. in the second, 1.5 mm. in the third, fourth, and fifth periods, and 3 mm. in the sixth period.

"At least three molts occur before the adult form of the nematode is developed. Important morphological changes associated with the molts include: After first molt, presence of preanal swelling (males) and of anal prominance in both sexes; after second molt, lips with oral papillae and dentigerous ridges, projecting lateral folds (alae) present in newly hatched larvae replaced by nonprojecting lateral lines, females with vulvu and shorter tail proportionately, and males with preanal sucker and three pairs of caudal papillae; after third molt, external characters similar to those of the adult *A. lineata*."

**Recent developments in the importance and control of the intestinal roundworm, Ascaridia lineata (Schneider), of chickens**, J. E. ACKERT (*U. S. Egg and Poultry Mag., 37 (1931), No. 6, pp. 58–60, 68–73, figs. 4*).—This is a practical account noted from another source (E. S. R., 64, p. 177.)

**Sarcosporidiosis in ducks**, W. A. RILEY (*Parasitology, 23 (1931), No. 3, pp. 282–285, pl. 1*).—This contribution from the Minnesota Experiment Station consists of a general review of the subject and presentation of additional cases,

**A laryngotracheitis syndrome in wild goose associated with pneumomycosis,** R. GRAHAM and F. THORP, JR. (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 1, pp. 90–94, figs. 3*).—The authors report upon a laryngotracheitis syndrome in a wild goose in Illinois, associated with gross exudative lesions of the respiratory tract and mild congestion of the lungs, which proved to be a mycotic pneumonia. The mycosis was not communicated by direct swab of the larnyx and trachea or by sterile filtrates prepared from the exudate in the respiratory tract when administered to healthy chicks one month of age.

## AGRICULTURAL ENGINEERING

**Surface water supply of the United States, 1928, V–VIII, X, XII C** (*U. S. Geol. Survey, Water-Supply Papers 665 (1931), pp. V+109, fig. 1; 666 (1931), pp. VII+207, fig. 1; 667 (1931), pp. IV+80, fig. 1; 668 (1931), pp. V+123, fig. 1; 670 (1931), pp. V+95, fig. 1; 674 (1931), pp. VI+155, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1928, No. 665, prepared in cooperation with the States of Minnesota, Wisconsin, Illinois, and Missouri, covers the Hudson Bay and upper Mississippi River Basins; No. 666, prepared in cooperation with the States of Montana, Wyoming, Colorado, Missouri, and Kansas, the Missouri River Basin; No. 667, prepared in cooperation with the States of Missouri, Arkansas, Colorado, Kansas, and Texas, the lower Mississippi River Basin; No. 668, prepared in cooperation with the State of Texas, the western Gulf of Mexico basins; No. 670, prepared in cooperation with the States of Utah, Nevada, California, Oregon, and Wyoming, the Great Basin; and No. 674, prepared in cooperation with the States of Oregon and Washington, the Pacific slope basins in Oregon and lower Columbia River Basin.

**Surface water supply of Snake River Basin, 1927** (*U. S. Geol. Survey, Water-Supply Paper 653 (1931), pp. VI+230, fig. 1*).—This report, prepared in cooperation with the States of Idaho, Oregon, Nevada, and Washington, presents the results of measurements of flow on streams in the Snake River Basin during the year ended September 30, 1927.

**Surface water supply of Pacific slope basins in California, 1929** (*U. S. Geol. Survey, Water-Supply Paper 691 (1931), pp. IX+294, fig. 1*).—This report, prepared in cooperation with the States of California and Oregon, presents the results of measurements of flow made on streams in the Pacific slope basins in California during the year ended September 30, 1929.

**Geology and water resources of the middle Deschutes River Basin, Oregon,** H. T. STEARNS (*U. S. Geol. Survey, Water-Supply Paper 637–D (1931), pp. V+125–212, pls. 9, figs. 5*).—The results of an investigation of the geology and water resources of an area of about 288 square miles in central Oregon are presented, the main purpose of which was to secure information relating to dam sites on the Crooked River from its mouth to Trail Crossing. The geology of the upper and lower box canyon dam sites on the Crooked River, and the Metolius dam site, on the Deschutes River, is described in detail.

The monthly maximum, minimum, and mean discharges of the Deschutes, Crooked, and Metolius Rivers are given for all gauging stations in the area. The quality of the surface and ground water of the area is excellent. The rivers are mostly fed by large springs, many of which lie within the area described. Records of all the wells and a map showing the contours of the water table are given. All the rocks older than the Deschutes formation yield water sparingly or not at all, but wells obtain large yields in the Deschutes formation, especially in the intercalated basalt flows below the water table. The intracanyon basalt also is very permeable but usually yields water only near the base.

The springs in the area are numerous. The spring inflow into the Crooked River in a stretch of about 19 miles amounts to about 950 cu. ft. a second, or 620 million gallons a day. Likewise, the Deschutes River in traversing the area gains about 400 cu. ft. a second of spring water. The total annual ground water discharge of this area amounts to about 1,000,000 acre-feet.

The power possibilities and the existing plants on the Deschutes and Crooked Rivers are described.

**Method to tell power stream will furnish,** W. H. SHELDON (*Michigan Sta. Quart. Bul, 14 (1931), No. 1, pp. 16–19, figs. 3*).—A method is described for determining the amount of power which a small stream is capable of developing, which involves the use of a temporary weir dam with a rectangular notch.

Graphic data are included on the width of the weir, depth of the water flowing over the weir, available head, and horsepower developed.

**Check dams control debris movements on mountain streams,** L. M. WINSOR (*Engin. News-Rec., 107 (1931), No. 8, pp. 290, 291, figs. 5*).—The results of investigations on the use of check dams and other means for separating débris from mountain streams under flood conditions in order that the water may be used for irrigation, as conducted by the U. S. D. A. Bureau of Public Roads and the Utah Experiment Station, are briefly presented. The control works consist essentially of a gravel barrier constructed across the stream bed at a location such that the stream above the barrier may spread over the area several times the normal width of the channel. This results in retardation of the velocity of the water some distance above the barrier and produces a pond of still water immediately above it. The stream commences to unload its burden at the point where it begins to widen, and by the time it reaches the spillway the heavier débris has been deposited. The water impounded behind the barrier acts as an equalizing reservoir and lowers the peaks of the floods.

**Terracing experiments, 1930–31,** H. H. FINNELL (*[Oklahoma] Panhandle Sta., Panhandle Bul. 31 (1931), pp. 3–9*).—This is the third progress report of these experiments (E. S. R., 61, p. 77; 63, pp. 276, 878). In general, it has been shown that terraces must be built close enough together to prevent excessive accumulations of water at any one place in the field during heavy rains. Impounding more water in a particular area than the crop occupying that space can effectively utilize results in waste which markedly decreases the efficiency of the terrace system.

In run-off studies it was found that the percentage was largely affected by the character of cover or crop on the land, the least run-off being observed where grass was growing.

There appears a tendency for the moisture gains accruing from terrace-held water to be proportional to the amount of run-off liability experienced during the period of accumulation.

Judging from a study of the character of the rainfall for the 20-year period in which records are available and the 6-year period during which the terrace experiments have been conducted, it would seem a fairly safe conclusion to assume the 6-year period, 1926–1931, a good average representation of normal rainfall conditions.

**Public Roads, [September, 1931]** (*U. S. Dept. Agr., Public Roads, 12 (1931), No. 7, pp. 181–196+[2], figs. 20*).—This number of this periodical contains the current status of Federal-aid road construction as of August 31, 1931, together with the following articles: The Soil Profile and the Subgrade Survey, by W. I. Watkins and H. Aaron (pp. 181–194); and Some Observations on the Modulus of Rupture of Frozen Concrete Beams, by A. P. Anderson (pp. 195, 196).

**Temperature of maturing of concrete with rapid-hardening cement,** N. Davey (*Concrete and Construct. Engin., 26 (1931), No. 5, pp. 311–315, figs. 2*).—The results of experiments conducted at the Building Research Station in England are reported. These emphasize the importance of the maturing temperature of concrete test pieces made on the job and of protecting small or thin concrete members from the action of cold when using rapid-hardening Portland cement. A large mass of concrete, on the other hand, will be able by its own internal heat to resist the action of cold.

**Experimental studies on the production of insulating board from cornstalks,** O. R. Sweeney, C. E. Hartford, jr., R. W. Richardson, and E. R. Whittemore (*Iowa Engin. Expt. Sta. Bul. 102 (1931), pp. 64, figs. 28*).—This rather detailed report of experiments conducted in cooperation with the U. S. Bureau of Standards showed in preliminary small-scale experiments that good insulating board can be made from cornstalks by various processes. Semicommercial studies showed that excellent insulating board can be made from pulp produced by digesting cornstalks in water and from pulp produced by mechanically pulping cornstalks. Various combinations of refining equipment were compared, and it was found that excellent results could be secured by using a rod mill and a Claflin refiner in series.

Studies were also made of sizing, fireproofing, and waterproofing, and methods and apparatus for testing the pulp and finished board are described.

**Studies in the painting of wood.—I, Influence of wood structure on paint behavior,** J. H. Haslam and S. Werthan (*Indus. and Engin. Chem., 23 (1931), No. 2, pp. 226–233, figs. 19*).—A new method for studying the structure of wood with relation to paint films is described which involves a microscopic examination of sections stained by selective dyes.

A brief description of the wood structure is followed by a discussion of the effect of wood upon the protective coating, including data on the changes occurring in spring and summer wood under the influence of moisture. Photographs and other data are presented to show that the structure of the wood surface and the nature of the vehicle control the degree and uniformity of penetration. It also was found that a slight uniform penetration of the vehicle of the paint into the wood is more desirable than deep irregular penetration.

**The Red Wing project on utilization of electricity in agriculture,** E. A. Stewart, J. M. Larson, and J. Romness (*Minnesota Sta., 1930, pp. [2]+153, figs. 168*).—A description is given of this project and of the experiments being conducted, near Red Wing, Minn., together with a rather extensive presentation of some of the experimental results.

**Operating water pumps with electric power,** T. E. Hienton (*Indiana Sta. Circ. 184 (1931), pp. 4, figs. 3*).—Practical information is presented.

**Gas engine experiments** [trans. title], A. Schnürle (*Ztschr. Ver. Deut. Ingen., 75 (1931), No. 4, pp. 101–105, figs. 24; abs. in Sci. Abs., Sect. B—Elect. Engin., 34 (1931), No. 403, p. 350*).—Experiments are reported, the main portion of which dealt with the use of suction gas and lighting gas in a single-cylinder engine, to determine the effect of the mixture ratio on the output, gas consumption, and heat loss.

The conclusions are that the maximum output is obtained only with a definite mixture, while there is a wider possible range of mixture for smaller loads. The best gas consumption at high loads is obtained with the greatest possible excess air, while at small loads the gas consumption falls at first and then rises as the air excess is increased. It was found that simultaneous adjustment of the inlet and exhaust valves gives regular operation and good gas consumption.

**Influence of engine conditions on the anti-knock rating of motor fuels,** R. STANSFIELD and F. B. THOLE (*Engineering* [*London*], *130* (*1930*), *Nos. 3378, pp. 468–470; 3380, pp. 512–514, figs. 7; abs. in Sci. Abs., Sect. B—Elect. Engin., 34* (*1931*), *No. 398, pp. 51, 52*).—Special investigations are reported with a highly sensitive spirit testing plant fitted with a bouncing pin indicator and a special instrument for determining the correct fuel feed and the antiknock value. The tests dealt with the effects of a wide range of variation of jacket temperature, different degrees of inlet air heating, variation of throttle opening, variation of spark plug gap and reach, ignition advance, and changes in humidity.

The test methods are described in detail, and the results presented in tables and graphs. The latter indicate that fuel testing engines of different design will give the best agreement when the inlet air is heated to between 120 and 180° F. and the jacket temperature is maintained at a little below the inlet air temperature. They also indicate the urgent need for a standard design of fuel testing plant.

**The adaptability of the combine to Indiana farms,** I. D. MAYER and J. C. BOTTUM (*Indiana Sta. Bul. 349* (*1931*), *pp. 59, figs. 24*).—This report presents the results of an investigation conducted partly in cooperation with the U. S. D. A. Bureaus of Public Roads, Plant Industry, and Agricultural Economics.

The data presented were obtained from (1) three years' records of farmer owned and operated combines, binders, and small stationary threshing machines, and (2) field tests with six makes of combines controlled and operated by the station, three combines being used experimentally each year. Detailed records of the harvesting of each field on the owner's farm were obtained, together with records by crops of the combining done on other farms. Binder and thresher records were secured in the same vicinities in which the combines were operated. Performance tests to determine the efficiency of cutting and threshing grain were conducted on combines, binders, and small threshers which were being operated by farmers. On the three combines operated experimentally on Purdue farms, efficiency of operation, adjustments, and attachments were studied and their performance compared with similar operations accomplished by the binder-thresher method of harvesting.

The results showed that grain from the combine was normally of as high a quality as that from the binder and thresher. When properly adjusted and operated, the combine saved a higher percentage of grains harvested than did the binder and thresher. When weedy grain or a large acreage of weak-strawed grain, such as oats, was harvested the windrow method was more satisfactory than was direct combining. When more than 120 acres were cut annually, the average cost of harvesting with the combine was less than the average cost of harvesting with the binder and thresher.

The average total acre costs for combining were approximately two-thirds of the total acre costs with the binder and thresher. Approximately one-fourth as much labor was necessary.

Appendixes discuss methods used in calculating combine costs and weather data. A list of 16 references to recent literature on the subject is included.

**Using the harvester combine for navy beans,** E. C. SAUVE (*Michigan Sta. Quart. Bul., 14* (*1931*), *No. 1, pp. 24–27, figs. 2*).—Actual experience is related in the harvesting of navy beans with a combine, and data are reported on the performance of combines as compared with bean hullers and grain threshers. The latter indicate that the loss of beans in the pods which pass through the machine lessens as the number of cracked beans increases. The regular bean thresher produced a considerable percentage of splits. It would appear that both the combine and the bean thresher need further mechanical improvements.

**[Construction, filling, and use of the trench silo]**, H. B. Osland (*Colorado Sta. Bul. 380 (1931), pp. 14–21, figs. 8*).—Practical information is given on the subject as it applies to Colorado conditions.

**The depth of sewage filters and the degree of purification**, A. M. Buswell, S. I. Strickhouser, et al. (*Ill. State Water Survey Bul. 26 [1928], pp. 100, figs. 19*).—Part 1 of this bulletin reports studies by Strickhouser and Buswell on the relation of the depth of a sprinkling filter to the degree of purification. The gradual evolution of sewage treatment as related to the development of the sprinkling filter is traced, and the theory of sewage purification in general and the various theories of the mechanism of purification by filtration are discussed.

A new conception of the mechanism of the purification process is proposed, based on an equilibrium between the adsorption, by the film, of colloids and soluble substances which lower the surface tension of water and the decomposition and oxidation of these substances by enzymes, bacteria, etc. Consideration of the oxygen requirements of the film emphasizes the necessity for intermittency.

The theoretical aspects of the relation of the depth of filter to the degree of purification indicate that the rate of purification should decrease with depth of filter. The literature on this subject is reviewed. The experimental data support the conclusion that there is a definite depth of filter (in this case, 6 ft.) beyond which the rate of purification is negligible. Very deep filters can not be dosed at rates strictly proportional to their depth because of the limiting factors of aeration, ponding, and clogging.

Part 2 reports confirmatory data obtained from an experimental trickling filter, by Buswell, E. L. Pearson, and G. E. Symons.

Part 3, by G. C. Habermeyer and H. L. White, reports data on trickling filter dosing, and part 4, by S. L. Neave and Buswell, reports biological data on the sprinkling filter.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**[Investigations in agricultural economics at the Kentucky Station, 1930]** (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 7–12*).—Investigations not previously noted are reported on as follows:

*Farm business organization.*—Analysis of records from 87 farms in Green, Taylor, and Adair Counties, 97 in Warren County, 139 in Todd County, 67 in Christian County, and 64 in Bourbon, Clark, and Montgomery Counties showed for the 20 most successful and the 20 least successful operators, respectively, in the first four areas average yearly earnings of $1,586, $5,099, $6,646, and $9,950 and $366, —$18, $27, and $37. For all farms the following averages were shown for the two groups: Returns per acre of tobacco $227 and $91, price received per pound of tobacco 22 and 18 cts., yield of corn per acre 68 and 30 bu., gross farm sales per acre $22 and $14, and expenses per $100 of receipts $52 and $99. The important factors in profitable farming were found to be emphasis on the enterprise having the greatest relative advantage, low cost of production, high productivity, high quality of product, efficiency of the day-to-day farm operations, and efficient control of expenses.

*Economic and social conditions in Knott County.*—Preliminary tabulations for 273 farms included in the study being made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, Forest Service, and Bureau of Home Economics showed the following averages: Size of farm 106 acres; area in cultivation 16⅝ acres; investment $2,606; receipts from crops $95, from livestock $82, and from outside work, gas and oil leases, and forest products $325; expenses, exclusive of unpaid family labor other than operator, $146; net income to the operator, his family, and on farm investment, $356; and estimated value of residence, fuel, and food derived from the farm, $464.

*Standard of living in farm families.*—Analysis of the data from 138 Grayson County families showed the following averages: Size of family 4.1 persons; income from farm products $857, from labor off the farm $52, and from other sources $41; expenses of farm business $578; family living purchased $385; total goods used $736, of which nearly half was produced on the farm; food $333, of which about one-third was purchased; clothing $140; furnishings and equipment $15; and operation goods $69, of which $41 worth was purchased.

**Labor efficiency in planting and harvesting on eastern Connecticut dairy farms** (*Connecticut Storrs Sta. Bul. 172* (*1931*), *pp. 54, figs. 5*).—This bulletin is a digest and summary of a master of science thesis by D. O. Hammerberg, and presents an analysis of the data regarding 5,400 49 acres of hay, oats, corn, and miscellaneous crops in eight towns of the eastern highland section of the State. Detailed farm records, mostly for two years but some for three years, were obtained from 115 farmers chiefly by the survey method during July and August, 1929. The area and type of farming are described, and comparisons are made of the labor inputs on crops with those in other States. Tables and graphs are included showing the effect on labor requirements for different operations of size, shape, and location of fields, stoniness, yields per acre, use of different kinds of equipment, and the size and organization of crews for haying and silo filling. Tests were made on three farms to determine the economy in using different kinds of equipment for silo filling. The statistical methods used are described, and comparisons are made of the results obtained with different methods.

The decreases in man hours required per acre in plowing, cultivating, mowing, and raking 1.5-acre fields as compared with 0.5-acre fields were 1.92, 0.81, 0.50, and 0.26, respectively. The decreases for 9.5- to 10.5-acre fields as compared with 0.5- to 1.5-acre fields were 3.20, 1.25, 0.87, and 0.46 hours, respectively. On fields of less than 2 acres, those of rectangular shape required considerably less man labor per acre for mowing. An increase of 100 feet in the distance hay was hauled increased the man hours per ton 0.044. With silage, no appreciable difference was found until the hauling distance exceeded 0.6 mile. An increase of 1 ton in yield of hay per acre decreased the man labor for hauling 0.35 hour. Man hours required per ton to cut corn by hand decreased from 1.45 with yields of 4 to 6.99 tons per acre to 0.94 hour for yields of 13 to 15.99 tons. With machine cutting the requirements were 0.33 hour with yields of 7 to 9.99 tons and 0.23 hour with yields of 10 to 12.99 tons. Corn planting required 3.79 hours of man labor per acre for hand planting, 4.83 hours of man labor and 2.42 hours of horse labor with 2 men and 1 horse and a single row planter, and 3.13 hours each with 1 man and 1 horse. Corn cutting with a yield slightly over 11 tons per acre required 9.32 man hours for hand cutting and 2.5 man hours with machinery. Hay loaders saved approximately 0.65 hour of man labor per ton of hay.

On the three test farms 1.22 man hours and 1.24 horse hours per ton were used in cutting corn and filling silos, as compared with 3.28 man hours and 1.42 horse hours, respectively, on 50 other farms.

**Harvesting the corn crop in Illinois,** P. E. Johnston and K. H. Myers (*Illinois Sta. Bul. 373* (*1931*), *pp. 353–405, figs. 8*).—This bulletin reports the results of a study made to ascertain the relative costs in terms of labor, power, equipment, materials, etc., of harvesting corn in Illinois by husking from the standing stalk, by cutting for silage, and by cutting and shocking and husking or feeding as whole fodder. The costs of hand husking from the stalk are based on data secured for 11,945 acres in east-central Illinois, 1920–

1928, and for 4,022 acres in west-central Illinois, 1923–1925. Data regarding mechanical huskers were obtained from 62 1–row and 25 2–row huskers in 1928 and 72 1–row and 39 2–row in 1929. Records for 1929 on the cost and physical requirements of filling silos were secured from 87 farms using stationary cutters and 81 using field silage harvesters. Similar data regarding stationary cutters were available on 198 farms in 1921 and 144 farms in 1922. Detailed cost account records from three areas were also available for longer periods. Data on field harvesters were also secured from 37 farms in 1928. The information on cutting and shocking and husking corn was obtained for 135 acres in 1927 and 1928 from 20 farms in Clinton County. Tables are included showing the itemized cost, costs per acre and per bushel, man labor, horse work, and other requirements for husking by hand and with 1- and 2-row mechanical huskers of different types and for filling silos with stationary cutters and field silage harvesters. The effects of yield and size of crew on costs and labor and power requirements are discussed with tables.

The average costs per acre of husking from stalks in 1928 and 1929 on the basis of a 50–bu. per acre yield were, by hand $5.25, with 1–row huskers $3.55, and with 2–row huskers $2.98. Family labor made up about 70 per cent of the labor with machines, but only about 30 per cent with hand husking. One-row machines averaged a little over 100 acres per season with 10 covering over 160 acres each. Two-row machines averaged 150 acres with 12 husking over 200 acres per season. The costs with 1–row machines ranged from less than 5 cts. to more than 12 cts. per bushel, and with 2-row machines from less than 5 to more than 8 cts. One-row machines left 1 bu. and 2–row machines 2 bu. more in the field than were left with hand picking.

Silo filling averaged $1.22 per ton with power take-off and horse-drawn motor-mounted machines, $1.48 with tractor-drawn motor-mounted machines, $1.29 with owned stationary cutters, $1.37 with hired stationary cutters, and $1.35 with custom field harvesters. An average of 1.25 hours of man labor per ton was used in cutting with field harvesters and 1.76 hours with stationary cutters. In cutting with binders an average crew of 10 men and 1.49 hours of labor per ton were used. An average crew of 16 men was used to cut by hand. The cost of filling silos varied directly with the amount of man labor per ton, being $1.24 per ton with field harvesters and $1.11 with stationary cutters using from 1 to 1.5 hours, and $1.91 and $1.85, respectively, with 2 to 2.5 hours used.

The advantages and disadvantages of the several methods and of hogging off corn are outlined.

**Retail credit in Iowa farmers' elevators,** F. Robotka (*Iowa Sta. Bul. 283* (*1931*), *pp. 257–312, figs. 8*).—This study was made to determine the magnitude of the retail credit problem of Iowa farmers' elevators; the effect of credit policies on volume of business, financial returns from their side lines, and their general prosperity; and the methods, experiences, and results of companies which have succeeded in eliminating or restricting credit selling to a minimum. The data were gathered by mailed schedules, detailed reports obtained from 50 companies by personal visits, audited financial statements for the year ended late in 1927 or early in 1928 of 93 companies distributed throughout the State, and from reports of discussions of the problem at 88 county and district meetings of managers and officers. Tables are included based chiefly on the audited statements showing the amounts of credit extended; the relation between notes and accounts receivable and side-line sales, total assets, outstanding capital stock, working capital and liabilities; and between bad debts and profits and volume of business. Other tables show the effect of credit policy on costs of credit, margins in side-line sales (total and for strict and liberal credit companies), bad-debt losses, credit sales, expenses, assets, liabilities, and costs of credit to patrons.

The prevailing credit practices and the methods used and results obtained by companies doing a limited credit business are discussed, and suggestions are made for the procedure in introducing more restricted credit. Credit-control plans on a 10-day and 30-day cash basis are outlined.

The receivables for the companies studied ranged from 2 to 95 per cent of the annual side-line sales, averaging about 25 per cent and being between 10 and 30 per cent for over half of the companies. While side-line sales were only 24 per cent of the total sales, the receivables absorbed 21 per cent of total capital, 73 per cent of share capital, and over 90 per cent of working capital. Credit costs averaged $1,943 per year per company, of which $695 was interest, $686 bad debts, and $562 office and collecting expenses. The average credit cost was 7.84 per cent of credit sales and 17.29 per cent of receivables carried.

If credit sales only had borne the costs of carrying credit, it would have been necessary to add to the margins 4.51 per cent of the credit sales for strict credit companies and 12.04 per cent for the most liberal companies. Credit sales on an average were unprofitable when receivables exceeded 15 per cent of the total annual side-line sales. Strict companies borrowed 7.2 per cent, and liberal companies almost 25 per cent, of their total capital requirements. No evidence of indirect benefits of liberal credit was revealed in the costs of operation, financial ratios, volume of business, or adequacy of capital. Credit at the elevators cost patrons on the average 7 per cent per year in case of the strict companies and 12 per cent in the liberal companies. but about two-thirds of the costs were passed on to the cash and grain patrons. The experience of the companies operating on a cash or restricted credit basis proved that such plans are successful.

**The farm business accounts**, G. W. FORSTER (*North Carolina Sta. Bul. 278* (*1931*), *pp. 28, fig. 1*).—This bulletin applies specifically to the farm inventory. The things the inventory should include, its limitations, and how taken and recorded, and the evaluation of lands, improvements, livestock, equipment, supplies, etc., are discussed. Examples are given of a complete inventory, a summary of inventory, and a financial statement. Appendixes include rules for estimating quantities of produce in bulk, legal weights of produce, suggestions for estimating the life of implements, and a discussion of the straight line, year digits, and reducing balance methods of calculating depreciation.

**Income from farm production in the United States** (*U. S. Dept. Agr., Crops and Markets, 8* (*1931*), *No. 9, pp. 397–404, fig. 1*).—Tables are presented and discussed showing, by years, (1) for 1919–1930 the gross income from farm production; (2) for 1924–1930 the gross cash income, farm value of products consumed on the farm, gross income by commodity groups, operating costs, wages, taxes, and interest paid, income available for operators' capital, labor, and management, current value of capital employed in agriculture, reward per farm family for labor and management, and farm income, factory wages, and their relative purchasing power, and for specified years, 1910–1928, the entire realized income from all industries and from agriculture; (3) for 1929–1930 the estimated farm value, gross income, and cash income of crops and livestock and livestock products by States and commodities; (4) for 1922–1930 for the United States and for geographic divisions by items the receipts, cash outlay, and noncash items; and (5) for 1923–1930 the percentages of farmers in different net income groups.

**The secular movement of corn prices**, G. S. SHEPHERD (*Iowa Sta. Research Bul. 140* (*1931*), *pp. 177–223, figs. 14*).—This study, which covers the period

1866–1930, is based primarily on data on production and prices of corn and livestock published by the U. S. Department of Agriculture. Charts and tables are included showing the production of corn, oats, and barley, the secular movements of corn prices and of the purchasing power of corn, percentages of corn crop used for different purposes, the number of livestock of different kinds on farms, changes in the demand for corn, purchasing power of hogs, Federal inspected and total slaughter of hogs, and the ratio of production of corn in nine Corn Belt States and in Iowa, Illinois, and Indiana to that in all other States. The effects of changes in livestock population, livestock purchasing power, and feeding methods on the demand for and the purchasing power of corn, 1866–1919, and since the World War, and the future of corn prices and of profits from corn growing are discussed.

Appendixes describe the statistical methods used in determining trends, the relationship between size of crop and purchasing power, and the number of livestock not on farms, and discuss the increase in corn export demand, the changes in small items, and the reasons for the lack of agreement between the number of hogs on farms and total number of hogs slaughtered.

The farm price of corn per bushel declined from 50 cts. in 1866 to 34 cts. in 1896, increased to 65 cts. by the outbreak of the war and to $1.40 during the war, and then declined to 75 cts. by the end of the period studied. The purchasing power, however, increased steadily from 1866 to 1919, nearly doubling in the period, the rise being due mainly to the increase in the purchasing power of livestock resulting from the demand for meat increasing faster than the supply. Since the war the purchasing power of corn has fallen about 25 per cent, due to a decrease in the demand resulting from (1) a decrease of 30 per cent in horses and mules and a reduction in the number of cattle and hogs on farms, (2) a fall of about 25 per cent in the purchasing power of hogs and cattle, (3) changes in livestock production practices, and (4) improvements in corn production practices and the northwestward movement of the Corn Belt resulting in an increased supply.

The conclusion is reached that the future trend in the purchasing power of corn is likely to move slowly downward. The production of corn will probably increase, while the demand for corn for horses and mules will probably decrease 5 or 6 per cent and that for cattle and hogs remain about the same, and the competition of other grains with corn will increase.

**The trend of corn prices**, G. S. Shepherd (*Iowa Sta. Bul. 284* (*1931*), *pp. 313–328, figs. 7*).—This is a condensed form of the research bulletin noted above.

**Relation of price to quality of South Carolina cotton, 1929–1930 season**, M. Guin (*South Carolina Sta. Bul. 279* (*1931*), *pp. 32, figs. 10*).—This bulletin brings the study previously noted (E. S. R., 65, p. 188) more up to date through the use of data for the 1929–30 crop obtained at seven primary markets chosen as representative of the State. Tables and graphs are included showing the distribution, by staple length and grade, of 12,746 bales tested; the variation in prices paid for the same staple lengths and grades on six of the seven markets on October 4, 1929; the premiums and discounts paid for different staple lengths and grades for white and spotted cotton on the different markets; and the average variations between local and central market prices. Comparisons are made of 1929–30 and 1928–29 results obtained in the study and of the percentage of lint and value per acre of the highest-yielding lint cotton of different staple lengths grown at Clemson College and Summerville, S. C., in the 1929–30 season.

Prices for the same quality of cotton on the same day varied greatly in the same local markets and between local markets, the variation being $2.50 per bale for strict middling 1⅝-in. cotton in the same market. Inferior cotton brought the higher prices in some markets. Buyers on local markets, while showing some tendency to recognize quality, were found to be discounting the shorter staples and poorer grades less and paying smaller premiums for the longer staples and better grades than the central markets. For every grade of spotted cotton the average local market premium was higher than that in the central markets. A comparison of the 1928–29 and 1929–30 prices did not indicate any improvement in buying on a quality basis in the local markets during the latter year. Presence of a large number of buyers in a market did not always insure the highest premiums.

The prices paid in the central markets showed quite large premiums for the grades above middling and staples longer than ⅞ in. and large discounts for the lower grades and shorter staple lengths.

The study at Clemson College showed that cotton with a staple length of 1¼ in. ranked first and second in yield of lint and first in value per acre in both the local and central markets. A variety with a staple length of $1\frac{1}{32}$ and $1\frac{1}{16}$ in. ranked third in lint yield and second in value. A 1⅛ to $1\frac{5}{32}$-in. variety ranked third in value per acre in the central markets, and a ⅞-in. staple third in the local markets. A $\frac{15}{16}$-in. variety was lowest in value per acre on the central markets and next to the lowest on the local markets.

**Prices paid to producers of South Dakota farm products, 1890–1930,** J. L. Orr (*South Dakota Sta. Bul. 259 (1931), pp. 20, figs. 11*).—Tables are included showing the average monthly prices for 1890–1930 of wheat, corn, oats, barley, flax, and hogs and for 1891–1930 of cattle and eggs and the relative annual prices, 1891–1930. Graphs are also included showing the relative prices, 1891–1930, and the average seasonal prices, 1891–1900 and 1921–1930. For the years subsequent to 1910 the prices collected by the U. S. D. A. Bureau of Agricultural Economics are used. For the preceding years the data were obtained from farm account and elevator records, newspaper files, and questionnaires sent to individuals, firms, and organizations.

**Crops and Markets, [September, 1931]** (*U. S. Dept. Agr., Crops and Markets, 8 (1931), No. 9, pp. 345–408, figs. 4*).—Included are the usual reports, summaries, tables, charts, and notes on cold storage holdings; cotton; crops and livestock; livestock, dairy, and poultry products; feedstuffs; grain; hay; seeds; prices; and foreign items. Especially dealt with in this number are dairy products manufactured in 1930; farmers' intentions to sow winter wheat and rye; farm mortgage loans, 1929; income from farm production in the United States (noted on page 187); and the following outlooks: Feed, 1931; hog, 1931–32; and midsummer beef cattle, 1931.

**California: An index to the State sources of agricultural statistics.—Parts III, Livestock and livestock products; IV, Land, farm property, irrigation, and miscellaneous items; V, An index to some unofficial sources** (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 31, pts. 3 (1931), pp. XLII+371; 4 (1931), pp. XLII+128; 5 (1930), pp. X+69*).—These indexes are a continuation of the bibliography previously noted (E. S. R., 65, p. 584). Part 3 includes the official sources for livestock and livestock products; part 4, the official sources for land, farm property, irrigation and crops grown under irrigation, mortgage debt, taxes, population, labor, reclamation and drainage, and some miscellaneous items; and part 5, the unofficial sources covering different farm crops, fruits, nuts, melons, vegetables, lumber, livestock and livestock products, irrigation, flour, and feeds. Parts 3 and 4 were compiled by L. O. Bercaw.

**Foreign trade of the United States, annual, 1790–1930: Rice and rice products,** C. G. Gries (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Sect.*

*Rpt. 53* (*1931*), *pp.* [*1*]+*26*, *fig. 1*).—Tables and a chart are included showing the annual exports, imports, reexports, and net balance, quantity and value, of rice, 1790–1930; of rice flour, meal, and broken rice, 1860–1930, and patna, 1926–1930; and the shipments, 1903–1930, from the United States to Alaska, Hawaii, and Porto Rico and to the United States from Hawaii.

**The demand for dried fruit in Germany,** M. J. Newhouse (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Sect. Rpt. 47* (*1930*), *pp.* [*1*]+*26*).—Germany as an importer of dried fruit and the factors relating to its demand for such fruit, its domestic fruit industry and import trade in such fruit, the trade practices and marketing developments in dried fruit distribution, and the prune packing industry are discussed.

**Business and banking periodicals reviewing the business situation,** compiled by M. I. Hebb (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 34* (*1931*), *pp.* [*2*]+*21*).—This is a selected list of United States and foreign publications compiled from the periodicals received in the libraries of the U. S. Department of Agriculture and the Federal Farm Board.

**Value of family living on Iowa farms,** E. E. Hoyt and E. C. Morgan (*Iowa Sta. Bul. 281* (*1931*), *pp. 185–239*, *figs. 2*).—Data were collected, beginning in the fall of 1926 and continuing three years, through household accounts and personal acquaintance. A new section of the State was chosen each year, and data were obtained from 45, 53, and 49 owner and tenant families in the respective years. Tables are included and discussed for each group of families showing the average value of food (total and by items), clothing, housing, fuel and light, and sundries (total and by items) and the proportions of each furnished by the farm. Other tables show, for the families arranged in value of living groups, the number of families, average size of families, and value of food, clothing, housing, fuel and light, and sundries (total and by items). The expenditures for clothing are shown by age and sex groups. The effect of tenancy on the expenditures, the nutriment of foods consumed, the educational influences, use of leisure time, and ambitions of the families studied are discussed. Comparisons are made of the findings of this study with those of other studies in Iowa and elsewhere. Copies of the schedule and questionnaire used are included.

The average household consisted of 4.8 persons. The average value of living was $1,624.95, that of three-fourths of the families being between $1,200 and $2,400. The farms furnished 42.6 per cent of the average value of living. Of the total value of living, 39.4 per cent was for food, 9.5 for clothing, 16.4 for housing, 6.2 for fuel and light, and 28.5 per cent for sundries.

The proportion of total expenditures spent for furnishings, recreation, education, and savings and insurance in general increased with the increase in the value of living. The proportion for automobile declined, and those for operating sundries, health, organizations, benevolences, and personal expenditures either remained constant or conformed to no general trend.

The average of all diets was found adequate for energy, protein, calcium, phosphorus, and iron, although some families showed deficiencies, particularly in iron.

**The rural health situation in South Dakota,** W. F. Kumlien (*South Dakota Sta. Bul. 258* (*1931*), *pp. 59*, *figs. 21*).—This bulletin reports the findings in a general study of the health agencies of the State and a more detailed study of the conditions in Brookings County. South Dakota not being in the United States Vital Statistics registration area, the data were obtained from the reports, records, etc., of and visits to representatives of the main health agencies of the State, questionnaires sent to a representative number of doctors, dentists, and hospital superintendents, a house-to-house health survey made by the author and an assistant in four representative townships of Brookings County, and a physical examination by a physician of all elementary and high school pupils in Brookings County except those in the city of Brookings.

The physical features, historical background, economic status, and social factors in the State and Brookings County are described. Tables, maps, and charts are included showing the number and distribution of practicing physicians and dentists, hospitals, nurses, and public health workers in the State and the training facilities of each group. Death rates in selected counties from communicable and noncommunicable diseases and for infant and maternal deaths are given. For the four townships and two small towns in Brookings County tables, maps, and charts are presented and discussed dealing with water supply; modern conveniences; sources of milk supply; excreta disposal; number of rooms in homes; home improvements; foods eaten, food habits of children; care in confinement cases; amount of sickness; adults' and children's disorders; health costs by items, total, and for adults and children; the average percentage of different physical defects among the children examined, etc. The health situation in the State as shown by the findings is discussed.

**George Washington and agriculture,** E. E. Edwards (*U. S. Dept. Agr., Library Bibliog. Contrib. 22 (1931), pp. VI+25*).—This is a classified list of annotated references grouped under the following headings: Washington's agricultural writings, Washington's farming activities, Mount Vernon—Washington's home, Washington and western land, and Washington's interest in internal improvements.

## FOODS—HUMAN NUTRITION

**A study of the function of emulsions of oil and water in breadmaking, with special reference to gluten formation and modification,** J. C. Van Dyk (*Jour. Soc. Chem. Indus., Trans., 49 (1930), No. 43, pp. 421T, 422T*).—The author has repeated the experiments of Bennion (E. S. R., 57, p. 389) in which he showed that emulsions of oil and water in breadmaking gave a considerable increase in the amount of gluten. No such increase was noted in preliminary experiments with Dutch flour. In a repetition of the experiment with an English flour and Wesson cooking oil supplied by Bennion, a slight increase was obtained, but of a much smaller order than that reported by him. The time and temperature of drying had a marked effect on the quality of the dry gluten. It is thought that the gluten increase obtained by Bennion was caused by some constant error connected with the washing out of the gluten.

**A quantitative measurement of the carbon dioxide evolved in and lost from simplified muffin batters,** I. T. Noble and E. G. Halliday (*Cereal Chem., 8 (1931), No. 2, pp. 165–167*).—In this study of the behavior of baking powders, measurements were made of the quantity of carbon dioxide evolved in, and the quantity lost from a batter or dough during its preparation. Four commercially prepared baking powders were tested, including a tartrate, a monocalcium phosphate, and two sodium aluminum sulfate-phosphate types. These were combined with (1) water alone, (2) a standard mixture consisting of flour 42, baking powder 3, fat 8.2, and water 46.8 per cent, (3) the standard mixture with milk substituted for water, and (4) the standard mixture with sugar added in the proportion of 4.9 and 9.8 per cent by weight.

In measuring the carbon dioxide liberated, the gas was collected in the gas burette of a Chittick carbon dioxide apparatus and measured as in the official gasometric method by displacement of a saturated aqueous solution of sodium chloride saturated also with carbon dioxide. In the second series, in which the carbon dioxide lost from the dough was measured, the gas was swept out of the mixing chamber for one hour, dried in a sulfuric acid tower, and the carbon dioxide fraction absorbed in weighed soda-lime tubes.

In the first series it was found that the baking powders when combined with other ingredients into a smooth batter evolved less carbon dioxide than when combined with water alone. The difference was slight with the phosphate and sodium aluminum sulfate-phosphate powders, but amounted to about 25 per cent with the tartrate powder. All of the types of baking powders tested evolved slightly more carbon dioxide when water was used than when milk was used in making the batter.

In the second series, the dough mixtures lost between one-half and two-thirds as much carbon dioxide during preparation as did the corresponding baking powder and water mixture. The batters containing water again lost slightly more than those containing milk. The addition of sugar up to 9.8 per cent of the ingredients had no effect upon the loss of carbon dioxide from the batter, and little difference was noted between the amount of carbon dioxide evolved during a mixing period of minimum length and one twice as long.

The results are considered of importance in showing that during the mixing of the simplified batters a large proportion of the gas evolved is actually lost. "Whether similar losses are sustained by batters which contain egg and a greater proportion of sugar than these must be determined by subsequent experiment."

**Mildly toasted wheat germ—a possible merchandisable table cereal,** R. Hertwig (*Cereal Chem., 8 (1931), No. 3, pp. 226–228*).—Wheat germ heated in a thin layer with frequent stirring at 120 to 130° C. until light brown in color is said to have a pleasing nutty flavor in place of the raw flavor and unpleasant aftertaste which makes ordinary wheat germ rather unpalatable and to have good keeping qualities, no change in taste or odor occurring after storage for 25 days at a temperature of 50° in glass jars, covered but without rubber gaskets.

**A toasted wheat germ self rising flour—a possible merchandisable cereal,** R. Hertwig (*Cereal Chem., 8 (1931), No. 3, pp. 229–231*).—Toasted wheat germ, prepared as described in the paper noted above, has been used in the development of a self-rising flour, the formula of which is given. "It is believed the addition of toasted wheat germ to flour for general baking purposes may deserve consideration for developing a new line of bakery goods with supplemented nutritional values, and thereby tend to increase flour consumption to the benefit of the milling industry and at the same time raise the vitamin level of the average diet."

**Powdered ripe banana in infant feeding,** S. V. Haas (*Arch. Ped., 48 (1931), No. 4, pp. 248–252*).—A method of preparing banana flour from fully ripe bananas is described, and data are given on the composition of the flour and its value in infant feeding.

The powder or flour, which is made by drying the freshly ground pulp by a spray process without access to air, is said to have a yellow color and a sweet banana-like odor and taste and to be readily miscible in milk or water except for a small percentage of cellulose which appears as minute particles in the mixture. The composition is given as moisture 2.5 per cent, ash (alkaline) 3.18, fat (ether extract) 1.5, protein (N×6.25) 4.86, crude fiber and cellulose 3.25, and nitrogen-free extract 84.71 per cent. The various components of the nitrogen-free extract are invert sugar 32.65 per cent, sucrose 33.18, dextrin

9.6, starch 7.8, and gums and undetermined 1.48 per cent. Based on the average full ripe banana, the fuel value of the flour is estimated to be 116 calories per ounce. Two level tablespoonfuls of the flour are equivalent to one average banana.

The flour is said to be well tolerated by infants when used in place of other carbohydrates in feeding mixtures, the customary quantity for infant feeding being from 1 to 3 oz. in the day's ration. The growth records of a group of 41 infants receiving banana flour milk showed an acceleration over the controls in the rate of growth in length but not in weight. The differences were most marked during the first six months.

**The content of plants, notably food plants, in aluminum** [trans. title], G. Bertrand and G. Lévy (*Compt. Rend. Acad. Sci.* [*Paris*], *192* (*1931*), *No. 9*, *pp. 525–529*).—In view of the conflicting evidence as to the presence of aluminum in plant materials, the authors have determined by a gravimetric method involving the use of large samples of material and the precipitation of the aluminum from the ash as phosphate the aluminum content of various types of vegetables, with the conclusion that aluminum exists in all flowering plants in widely varying amounts. Edible roots, which, through culture, have developed considerable parenchymatous tissue, ordinarily contained much less aluminum than ordinary roots. Extremes reported are the root of the sugar beet containing 6 mg. and of beans 1,640 mg. per kilogram of dry matter. The content of aluminum in tubercles, bulbs, and most fleshy and succulent fruits was in general of the same order as that of edible roots. Grains and seeds were very low in aluminum, containing from about 0.5 to 10 mg. per kilogram of dry matter. Green, leafy vegetables ordinarily contained the highest proportion of aluminum. Among the values given are spinach from 96 to 104, rhubarb leaves 166, radish leaves from 157 to 280, and Ceylon tea leaves 465 mg. per kilogram of dry material.

**Food consumption of boys and girls in six typical agricultural high schools of Mississippi**, D. Dickins (*Mississippi Sta. Bul. 292* (*1931*), *pp. 32*, *fig. 1*).—This study is a part of a larger investigation of the agricultural high school dormitories of the State. As an aid in the selection of schools in which to conduct a quantitative study of food consumption, menus for 3 successive school days were secured from 40 of the entire number of 47 schools and scored according to the optimum score card of Davies (E. S. R., 59, p. 790). On the basis of these scores divided into three groups, representing high, average, and low scores, 2 schools were selected to represent each group, with a general distribution throughout the State. A quantitative record of food consumption for 13 consecutive meals was secured from a total of 35 boys and 40 girls, representing ages of 15, 16, 17, and 18 to 19 years in each of the three groups. Supplemental data were secured on height and weight and activities of the students. All six studies were conducted in the spring, two in 1929 and the other four in 1930. The method of conducting the study is described in considerable detail.

The data were analyzed for adequacy of food consumption in energy, protein, calcium, phosphorus, and iron, and costs were determined. In comparing the diets with the preliminary scores of the menus there seemed to be no correlation in regard to energy value and protein, but the calcium and phosphorus content ran parallel to the supposed relative adequacy of the diets. The iron content of some of the lower grade diets proved higher than of the supposedly better ones on account of the large consumption of sirups with a high iron content. The girls ate about 40 per cent less than the boys, and this was true of minerals and protein as well as of energy.

In discussing the food consumption of the students relative to their needs, records are also reported on the food eaten between meals. This proved to be very limited, but was included in the estimated food consumption. The average distribution of the total food consumption for the 15- to 17-year-old groups for boys and girls, respectively, was calories 3,687 and 2,347, protein 103.9 and 66.6 gm., calcium 1.221 and 0.765, phosphorus 1.924 and 1.088, and iron 0.0209 and 0.0136 gm. Corresponding values for the 18- to 19-year-old boys and girls were calories 3,993 and 2,404, protein 101.8 and 62.9 gm., calcium 1.294 and 0.651, phosphorus 1.763 and 1.089, and iron 0.0190 and 0.0014 gm., respectively.

All four groups made the standards suggested by Rose for caloric and protein intake per kilogram of body weight and the minimum daily phosphorus requirement of 0.044 gm. per 100 calories. Considering the 15-, 16-, and 17-year-old groups as children with a standard of 1 gm. of calcium per day and the 18- to 19-year-old groups as adults with a standard of 0.023 gm. of calcium per 100 calories per day, the 15-, 16-, and 17-year-old girls received insufficient calcium. The 18- to 19-year-old boys and girls were below the standard for iron.

In the distribution of calories by food groups, 31 per cent came from cereals, 28 from fats, 13 from sweets, 8 from meats, eggs, and cheese, 10 from milk, and 9 per cent from fruits and vegetables. Cereals, fats, and sweets exceeded the customary standard distribution, milk, fruits, and vegetables fell below, and meats, eggs, and cheese were within the limits.

The average money value of the food consumed per student per day was 31 cts. for the boys and 20 cts. for the girls in the 15-, 16-, and 17-year-old groups and 30 and 22 cts., respectively, for the 18- to 19-year-old boys and girls. The cost was highest for the group considered from the preliminary survey to have the best menus, but there was very little difference between the other two groups.

Of particular value to those in charge of similar school dormitories is the discussion of the menus, money value of the food, and the problem of raising food on the school farm.

**Some controverted questions in nutrition,** J. R. Murlin (*Jour. Amer. Dietet. Assoc., 6 (1931), No. 4, pp. 299–306*).—The controverted questions discussed in this paper, presented at the annual convention of the American Dietetic Association in Toronto, September 10, 1930, are vegetarianism from the standpoint of adequate protein, luxus consumption, or the question of the constancy of basal metabolism, and the nature of the fuel required for muscular work.

**The development of the science of nutrition in relation to disease,** J. B. Orr (*Brit. Med. Jour., No. 3672 (1931), pp. 883–886*).—This is a summary of a British Medical Association lecture in which the author discussed briefly recent research on the relation of diet to composition of the blood, immunological reactions, and bacterial flora in various parts of the body, and suggested lines along which future research in nutrition should be conducted.

"We need more information dealing with the amounts of different nutrients required for optimum growth in children, and for the maintenance of health, and also as to the amounts of these nutrients present in dietaries in common use. A concerted international effort to elucidate whether there is a correlation, and, if so, to what extent, between dietary habits, physique, and incidence of disease in the different populations throughout the world would yield results of fascinating interest. . . . In addition to such dietary studies, an urgent need exists for more clinical research on nutritional lines. There are a number of diseases of which the main symptoms are those of disturbance of the normal digestive or metabolic processes—for example, gastric and duodenal ulcers, constipation and its sequelae, rheumatism, anemias, high blood pressure, and cardiac and nephritic disorders. The etiology of these remains obscure. It has been suggested that they originate in long-continued errors of diet. As a matter of fact, we have very little definite evidence to show to what extent hereditary, nutritional, and other factors are involved. An extended series of studies of previous nutritional histories, of the condition of the circulating fluids, and of the influence of dietary factors on the course of these diseases might throw much needed light on their etiology."

The importance is urged of cooperation among biochemists, immunologists, and clinicians in such research and of a coordination of research on the larger domestic animals with that on human beings.

**Nitrogen, calcium, and phosphorus balances in late gestation under a specified dietary régime,** I. G. MACY, E. DONELSON, M. L. LONG, A. GRAHAM, M. E. SWEENY, and M. M. SHAW (*Jour. Amer. Dietet. Assoc., 6 (1931), No. 4, pp. 314–320*).—This case report on the diet, metabolism of calcium, phosphorus, and nitrogen, and composition of the urine of a healthy woman during the seventh and eighth months of a first pregnancy is presented in the belief that "it is only through the accumulation of such case histories that the fundamental knowledge of maternal well-being, upon which sound advice can be based and disseminated, can be acquired."

The information on the diet includes the entire list of foods used, representative menus, and analyses of the diet for carbohydrate, protein, fat, calcium, phosphorus, and total calories. The summarized metabolism data show that the diet was fully adequate in that the balances for nitrogen, calcium, and phosphorus were all positive. The values for the constituents in the blood serum and urine were likewise within normal limits. "The subject was able to continue her usual physical and mental activities throughout the prenatal period, passed through an uneventful delivery, and was able in the lactation period to produce milk of sufficient quantity and of good enough quality to stimulate and maintain the growth and development of the infant at a satisfactory rate throughout the nursing period."

**Chylomicron content and total lipids of blood plasma as determined on dogs,** E. H. MACARTHUR (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 5, pp. 555–557*).—The author has extended her studies of fat metabolism by means of the chylomicron count of the blood (E. S. R., 64, p. 194) to dogs, with results indicating a correlation, although not high, between the chylomicron content of the blood and the total lipids as determined by chemical analysis.

**Effect of nutritional anemia on size of the heart,** M. B. FORMAN and A. L. DANIELS (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 5, pp. 479, 480*).—In this preliminary report, data are summarized indicating a close correlation between the size of the heart and the degree of nutritional anemia in rats. At very low hemoglobin values, from 2 to 3 gm. per 100 cc., the heart weight averaged approximately three times that of normal animals.

**Observations on the nutritive value of certain fats,** C. E. GRAHAM and W. H. GRIFFITH (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 7, pp. 756–758*).—In this preliminary report of experiments concerned with the growth of rats on low fat diets, it is noted that young rats on the basal fat-free diet of Burr and Burr (E. S. R., 62, p. 292) supplemented daily with 0.5 gm. of whole dried yeast and 9 drops of cod-liver oil have developed feet and tail symptoms apparently identical with those reported by Burr and Burr as occurring on the fat-free diet. The condition was not prevented by doubling the daily yeast supplement or by adding an active extract of rice polishings or of liver, but was for the most part prevented by wheat germ oil, lard, and whole liver, the wheat germ being the most and the lard the least effective. The effect of the lard was greater when the amount of cod-liver oil was decreased, and the severity of the tail condition was greater in rats given 12 drops of cod-liver oil daily than in those given only 9 drops. The question is raised as to whether the condition developing in the feet and tails is the result of a deficiency in an unknown food factor or of the presence of a toxic substance in the cod-liver oil.

**On the nutritive value of certain oils, G. O. and M. M. Burr and W. R. Brown** (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 905–907*).—It is noted that although in earlier work (E. S. R., 63, p. 595) it was thought that rats receiving cod-liver oil as a supplement to the fat-free diet used were always normal in appearance, later work has confirmed to some extent the observations of Sinclair (E. S. R., 64, p. 494) and Graham and Griffith (noted above) that the feeding of cod-liver oil does not prevent scaliness of feet and tails, although it does cause renewed growth. It is pointed out that cod-liver oil differs from other oils in that it is highly unsaturated without linolic and linolenic acids being present in appreciable quantities. The authors have been unable to confirm fully the observation of Sinclair that rats which have access to their feces do not develop the scaly condition. A very slight prophylactic effect only was apparent.

It is concluded that the fat deficiency may resolve itself into two factors, one affecting growth and the other the condition of the skin, but that linolic and linolenic acids relieve both of these abnormal conditions.

**Vitamin content of turnip greens, collards, cantaloupes, and peaches, C. L. Newton** (*Georgia Sta. Bul. 167 (1931), pp. 20, figs. 3*).—This report of an investigation noted previously from progress reports (E. S. R., 65, p. 192) includes a brief summary of present knowledge concerning the function of vitamins A, B, C, D, and G and of the methods followed in the quantitative estimation of all but vitamin D in the materials studied, and summarized experimental data in terms of average growth records, survival periods, and in the case of vitamin C autopsy findings. In a final table are listed the amounts of food in grams furnishing 1 unit of the various vitamins and the approximate number of Sherman units contained in 1 oz.

Turnip greens, either raw, boiled 45 minutes, or canned after blanching in boiling water, contained 1,418 units per ounce of vitamin A. From incomplete data on vitamin B, a tentative value of 14 units per ounce is given for the raw greens. No determinations were made of their vitamin G content. The numbers of vitamin C units per ounce are given as 95 for the raw turnip greens, 14 for greens boiled 45 minutes or canned with steam blanching, 6 for greens boiled 2 hours, and 7 units per ounce for the greens canned after blanching in boiling water.

Collards raw or boiled for 2 hours contained the same number of units of vitamin A, 1,418 per ounce, as turnip greens, twice as much vitamin B (tentative value of 28 units per ounce), and about the same amount of vitamin G as of B in unit values. The collards furnished 57 units of vitamin C per ounce when raw and 14 units after boiling for 2 hours.

The values given for fresh cantaloupes of the Hearts of Gold variety were vitamin A 95, vitamin B less than 7, and vitamin C 10 units per ounce. Tentative values for the vitamin A content of frozen peaches were 14 units per ounce for the Elberta and less than 14 for the Hiley variety. Both varieties contained less than 0.5 unit per ounce of vitamin C.

**Effect of withdrawal of vitamin-A on leukocyte and differential count in the albino rat, R. G. Turner and E. R. Loew** (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 5, pp. 506–510, fig. 1*).—Supplementing a previous study on the composition of the blood of rats suffering from vitamin A deficiency (E. S. R., 64, p. 496), the authors have determined the total leucocyte count and differential count of the blood of rats during various stages of the disease.

The average white blood cell count of the rats on the vitamin A-deficient diet showed no increase over that of the controls until the forty-sixth experimental day, at which time most of the animals showed a mild form of xerophthalmia. At the fifty-ninth experimental day, when the animals showed moderate xerophthalmia, the average count of those on the deficient diet showed an increase of 4,000 white blood cells per cubic millimeter over the highest average in the controls. The average count of six animals remaining on the deficient diet for 74 days showed a continued rise.

The average differential count on the forty-sixth experimental day showed a slight increase in the relative percentage of polymorphs, with a corresponding decrease in lymphocytes for the vitamin-deficient animals. This change became more marked until in the animals showing gross pathological symptoms the increase in polymorphs reached 67, while the lymphocytes had dropped to 31 per cent. In normal rats the lymphocytes amount to about 75 and the polymorphs to about 20 per cent of the white blood cells. "The leucocytosis observed in the xerophthalmic animals, together with an increase in the relative percentage of polymorphonuclear cells and a decrease in the lymphocytes, logically must be considered as a leucocytic defense of the individual animal to combat the invasion of virulent organisms. Is there then a lowered resistance of the specific membrane on which the organism gains control? Lowered resistance of the body is generally noted by an increase in the number of leucocytes, the phagocytes being less in number."

**The vitamin $B_1$ content of liver extract, E. Gilroy** (*Lancet [London], 1931, I, No. 26, pp. 1423, 1424; also in Brit. Med. Jour., No. 3678 (1931), p. 34*).—In this brief note, attention is called to observations indicating that "proprietary liver extracts are divisible into two sharply defined groups, those which contain considerable quantities of the antineuritic factor $B_1$ and those in which $B_1$ is present in negligible amount. There is no intermediate class if equivalents of fresh liver are compared, and the first category includes the majority of the extracts tested."

Of eight different liver extracts used in the treatment of pernicious anemia, six were found to be efficient sources of vitamin $B_1$ as well as $B_2$. Three stomach preparations also used in the treatment of pernicious anemia were found to be good sources of both vitamins $B_1$ and $B_2$. It is suggested that liver extracts proved to be rich in $B_1$ as well as in $B_2$ should be included "in the list of medicaments available for use in cases in which administration of the vitamin B complex is indicated. Clinical evidence can indeed be adduced that such extracts are of practical value as general tonics, a fact which may be partly attributable to their vitamin content."

**Polished rice and brown rice compared** (*Kentucky Sta. Rpt. 1930, pt. 1, p. 27*).—In this progress report it is noted that brown rice, whole wheat, and yellow corn when fed as the sole diet to pigeons which had developed polyneuritis and lost weight on polished rice were all capable of restoring weight and curing the polyneuritis, but that white corn, rye, and barley cured polyneuritis but did not produce any gains in weight. "These results indicate that brown rice, whole wheat, and yellow corn (partially) contain vitamin B and $B_2$, whereas white corn, barley, and rye apparently contain vitamin B but not the $B_2$ factor."

**Constitution of a new diet relatively poor in carbohydrates and rich in fats for the study of vitamin B deficiencies** [trans. title], **L. Randoin and R. Lecoq** (*Compt. Rend. Acad. Sci. [Paris], 192 (1931), No. 7, pp. 444–447*).—A new basal vitamin B-free diet for pigeons is described. This diet, which is said to be based upon the composition of dried milk instead of a mixture of grains as was the case with the basal diet of Randoin and Simonnet previously used (E. S. R., 51, p. 70), consists of purified casein 8, purified fibrin 8, ovalbumin 8, purified butterfat 8, lard 18, a pure or purified carbohydrate 35, Osborne and Mendel salt mixture 5, agar 8, and filter paper 2 per cent. When supplemented with from 0.35 to 0.5 gm. of dried brewery yeast daily, the diet suffices for maintenance. Without the yeast, the survival period is from 20 to 30 days when the carbohydrate is glucose, levulose, maltose, sucrose, dextrin, or cornstarch, from 35 to 50 days with galactose, from 25 to 50 days with lactose, and from 40 to 60 days with potato starch. The longer survival periods on these carbohydrates are thought to support the theory that the rapidity of onset of polyneuritis is proportional to the rapidity of intestinal absorption of the carbohydrate.

**Studies in the physiology of vitamins.—XIV, The effect of administration of large amounts of water on the time required for development of the anorexia characteristic of a deficiency of the vitamin B complex,** G. R. Cowgill, H. A. Rosenberg, and J. Rogoff (*Amer. Jour. Physiol., 95 (1930), No. 3, pp. 537–541*).—In this continuation of the investigation noted previously (E. S. R., 63, p. 895), the theory that the symptoms of vitamin B ($B_1$) deficiency are essentially those of a toxemia was tested by the administration of large amounts of fluids by mouth to dogs on a diet deficient in vitamin B. It was thought that if this prolonged the period before anorexia developed it would show that anorexia is the result of an accumulation of toxins which, in this instance, would be washed out by the water. The data obtained showed that the appearance of anorexia, in place of being delayed, was definitely hastened by the treatment.

It is suggested that the frequent treatment of marasmic infants by subcutaneous, intravenous, or rectal administration of fluids may actually be detrimental in that it washes out vitamin B from the body. "It seems logical, in the light of the experiments here reported, to combine the recognized and approved methods of treatment of such cases of marasmus with the administration of some potent source of vitamin B."

**The vitamin C content of fresh and canned spinach, Swiss chard, asparagus, and carrots,** G. E. Wasson (*South Dakota Sta. Bul. 261 (1931), pp. 28, figs. 13*).—This is the complete report, with experimental data, of vitamin studies, the general results of which for all of the materials except carrots have been noted previously from progress reports (E. S. R., 63, p. 94; 64, p. 693).

The carrots tested included samples pulled in August and October. Of the former, some were canned by the hot pack method as recommended in Farmers' Bulletin 1471 (E. S. R., 55, p. 189), some cooked until tender in an open kettle in enough water to cover, and some placed in cold storage. Some of the October carrots were packed in sand and stored in a root cellar and others cooked in an open kettle as were the August samples.

The raw carrots were fed in amounts of 10 gm. for the August samples and of 10 and 15 gm. for the stored October samples. Although the guinea pigs grew well and appeared superficially to be in good condition, histological examination showed incomplete protection against scurvy. This was also true of the groups receiving 20 and 30 gm. of home canned carrots, 20 gm. of the cooked August carrots, and 20 and 30 gm. of the cooked October carrots. It was concluded that, as judged by histological examination on autopsy, "all portions fell below a protective dosage, and that the August carrots, the cooked and the canned carrots, both the 20 gm. and 30 gm., are a little lower in vitamin C potency than the other portions."

**Hematopoietic function in avitaminosis, IV–VI** (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 5, pp. 495–499*).—The series of papers noted previously (E. S. R., 62, p. 297) is continued by three brief reports as follows:

IV. *Further studies of vitamin A deficiency*, B. Sure, M. C. Kik, and D. J. Walker (pp. 495, 496).—An extension of the studies noted in the first paper of the series has led to the conclusion that no noticeable disturbance in hematopoietic function takes place in the various stages of vitamin A deficiency, and that there are no changes in the differential leucocyte counts during the onset and remission of this avitaminosis.

V. *Vitamin D deficiency*, B. Sure and M. C. Kik (pp. 496–498).—Rats kept on the Steenbock-Black rachitic diet No. 2965 showed evidence of anemia as judged by the concentration of hemoglobin and erythrocyte counts. Since the same blood pictures were shown by the animals receiving the same ration irradiated and consequently protected from rickets, the authors conclude that "vitamin D deficiency has no influence on hematopoietic function."

VI. *Vitamin G deficiency*, B. Sure, M. C. Kik, and M. E. Smith (pp. 498, 499).—In this study, 10 out of 14 rats which had developed dermatitis on the vitamin G-deficient diet noted previously (E. S. R., 65, p. 495) gave evidence of marked anemia, while among 16 animals showing loss of weight unaccompanied by dermatitis anemia was observed in only 6, and in 3 of these the condition could be attributed to anorexia.

The authors conclude that an anemia occurs in vitamin G deficiency when accompanied by skin lesions comparable to those found in human pellagra. Since the diets used contained an abundance of ferric citrate and since such anemias did not respond to the administration of the ash from yeast, it was concluded that the anemia encountered was not produced by a mineral deficiency.

## TEXTILES AND CLOTHING

**Rompers,** C. L. Scott (*U. S. Dept. Agr. Leaflet 79 (1931), pp. 8, figs. 7*).—This leaflet gives practical suggestions, with photographs and sketches, of types of rompers suitable for all occasions for babies 5 or 6 months of age.

## MISCELLANEOUS

**Forty-second Annual Report of the Kentucky Agricultural Experiment Station for the year 1929, Part II** (*Kentucky Sta. Rpt. 1929, pt. 2, pp.* [2]+*401*+[3], *figs. 42*).—This contains reprints of Bulletins 291–298, all of which have been previously noted.

**Forty-third Annual Report of [Kentucky Station], 1930, I,** T. P. Cooper (*Kentucky Sta. Rpt. 1930, pt. 1, pp. 48*).—Part 1 of this report contains the organization list, a financial statement as to the Federal funds for the fiscal year ended June 30, 1930, a report of the director on the work and publications of the year, and meteorological data. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

**Forty-third Annual Report of the [Michigan Station, 1930]** (*Michigan Sta. Rpt. 1930, pp. 173–233, figs. 18*).—This contains reports of the heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue or previously. Analyses of vinegar are also included (p. 193).

**Williston Substation Report, April 1, 1930, to March 31, 1931,** E. G. Schollander (*North Dakota Sta. Bul. 248 (1931), pp. 41, figs. 12*).—The experimental work recorded is for the most part abstracted elsewhere in this issue. Meteorological data for 1930 are also included.

**Annual summary of publications, July 1, 1930, to June 30, 1931,** B. C. Pittman (*Utah Sta. Circ. 95 (1931), pp. 16*).—In addition to abstracts of Bulletins 220–230 and Circulars 88–94, this contains abstracts of scientific articles published outside the station series and noted elsewhere in this issue or previously.

# NOTES

**Iowa College and Station.**—*Iowa Agriculturist* notes that a new beef cattle barn is being erected at a cost of about $21,000 to replace a similar structure destroyed by fire on October 7, 1931.

**Kansas College.**—*Kansas Industrialist* states that the total enrollment is reported as 2,894 as compared with 3,013 in 1930. In the division of agriculture the respective registrations are 393 and 428, in home economics 448 and 487, and in engineering 875 and 961. An increase from 1,010 to 1,020 is noted in the division of general science and one from 121 to 155 in that of veterinary medicine.

**Louisiana University.**—J. W. Bateman has assumed active charge as head of the agricultural extension division vice W. B. Mercier, who continues in an advisory capacity as director emeritus.

**Massachusetts Station.**—Walter L. Cutler, technical assistant in pomology since 1925, died October 31, 1931, at the age of 29 years. Mr. Cutler was a native of Vermont and was graduated from the Stockbridge School of Agriculture of the Massachusetts College in 1923.

**Minnesota University and Station.**—Dr. R. W. Murchie, professor of rural sociology and agricultural economics at the Manitoba Agricultural College, was appointed professor and director of rural sociological research beginning October 1, 1931, vice Dr. C. C. Zimmerman, resigned to accept a position in Harvard University.

**New York State Station.**—The new horticultural laboratory building, the first addition to the station laboratory space since 1898, has now been completed, thereby greatly relieving the congestion that has prevailed for several years. The building will house the divisions of pomology, vegetable crops, and botany, including the work with soils and nursery stocks and the seed laboratory.

**South Dakota College and Station.**—Paul H. Landis has been appointed instructor and assistant in rural sociology.

**Texas Station.**—A citrus laboratory is to be erected by the U. S. D. A. Bureau of Chemistry and Soils on the grounds of the substation at Weslaco in the Rio Grande Valley for the study of citrus fruit culls and their by-products. A building for this work is to be erected by the chambers of commerce of Weslaco and Mercedes. The first year's program will center largely around problems of grapefruit utilization, including the stage of maturity most favorable for preservation, the utilization of waste from canneries and juice factories, and the feasibility of preparing grapefruit oil, pectin, naringin, and other valuable constituents from oil and waste material.

**Sixth International Congress of Genetics.**—This congress will be held in Ithaca, N. Y., from August 24 to 31, 1932. It is planned to pay special attention to plant and animal breeding and to plant pathology and comparative pathology. The exhibits, as planned, should include many features of particular interest to experiment station workers in these fields. Investigators with material to exhibit which bears on the genetic aspect of any of these subjects should communicate with M. Demerec, Station for Experimental Evolution, Cold Spring Harbor, N. Y. Information concerning membership in the congress can be obtained from Dr. C. C. Little, Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Me.

# EXPERIMENT STATION RECORD

VOL. 66 FEBRUARY ABSTRACT NUMBER No. 3

## RECENT WORK IN AGRICULTURAL SCIENCE

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**Physicochemical properties of edible-canna and potato starches,** J. C. RIPPERTON (*Hawaii Sta. Bul. 63 (1931), pp. 48, figs. 14*).—In this work, previously noted (E S. R., 65, p. 712), determinations of hydrogen-ion concentration in the water extract of starches proved to be unreliable. Electrometric measurement of the starch suspension was found to be a very satisfactory method.

"The effect of different neutral salts on swell and viscosity was found to be proportional to the valency of the cation, the greater the valency the greater the depression of swell and viscosity. The anions had little effect. Sodium hydroxide produced initial increase with subsequent decrease. Substitution of monovalent cations in the raw starches greatly increased the swell and viscosity of all the starches. Bivalent cations generally caused a decrease. Trivalent cations caused a very large decrease. Removal of the cations by acid and electrodialysis caused the granule to burst when cooked. Investigation of the causes of differences in starches of the same kind showed that the starches of greatest swell and viscosity were unsaturated as to cations and had a low pH. Analysis of the electrolytes removed by electrodialysis and displacement with sodium chloride showed that the low-viscosity starches contained appreciably more calcium than the high-viscosity starches. The possibility of preventing substitution of calcium in the starch granule either in the process of manufacture or during the growth of the plant is suggested. Difference in size of granules, or in amount of broken granules, was not found to be the cause of difference in viscosity in the starches used."

Comparison of the properties of edible-canna and potato starches showed that the latter is probably somewhat superior in swell and viscosity.

**Starch gels,** S. WOODRUFF and L. NICOLI (*Cereal Chem., 8 (1931), No. 4, pp. 243–251, figs. 6*).—The starches used in this study were the cereal starches of corn, wheat, and rice and the tuber starches of potato, arrowroot, and cassava. All were used as purchased without further purification. Analyses showed a moisture content varying from 10.25 to 14.29 per cent, ash from 0.13 to 0.7, and nitrogen from 0.012 to 0.071 per cent. The general method followed in determining the character of the gels from the various starches consisted in heating to the desired temperature 100 gm. of a 5 per cent by weight suspension of the starch in water in a 150 cc. test tube immersed in a beaker of distilled water behind which a strong light was placed. The tube was then removed from the beaker, water added to make up for the slight loss in evaporation, and the paste poured while hot into small porcelain crucibles. At the end of 24 hours the gels were turned out on watch crystals, examined for general appearance and firmness, and photographed.

During the heating a sudden increase in the translucency of the product occurred within a slight temperature range which was specific for each starch as follows: Corn 86 to 87° C., wheat 87 to 88°, rice 84 to 85°, potato 69 to 70°, arrowroot 79 to 80°, and cassava 74 to 75°. At these temperatures the paste appeared to reach its maximum translucency, although this was accompanied by decided swelling of the starch grains and the starches did not form good gels. After the temperature had been raised to 99.5°, well-formed gels were obtained with the cereal starches, but not with the tuber and root starches. Long continued heating at the temperatures of greatest translucency did not yield gels as firm as those obtained at 99.5°.

Since the final inner temperature of baked flour mixtures, cooked potatoes, and flour-thickened sauces has been observed to be about 100°, it is concluded that maximum gelation of the starch probably occurs in the ordinary cooking of such products.

The addition of sucrose to the starch-water mixture in amounts of 10, 30, and 50 per cent gave gels of increasing transparency and tenderness, but well-formed only in the case of the three cereal starches. Although the root starches yielded poor gels without sugar, a notable increase in the softness of the gel occurred with the addition of as small an amount as 10 per cent of sugar. With 60 per cent of sugar a viscous, sirupy mass resulted with all of the starches.

**Interconversion of hexose sugars by means of phosphates, H. A. Spoehr and H. H. Strain** (*Carnegie Inst. Wash. Yearbook 27 (1927-28), pp. 176, 177*).—Investigations on the interconversion of carbohydrates by purely chemical means (E. S. R., 55, p. 628) have been continued, with the aim of elucidating eventually the fundamental (pure) chemistry of these reactions as basal to the determination of the biologically important transformations of the carbohydrates. This work and its results are briefly detailed, with discussion.

**Yellow leaf pigments, H. A. Spoehr, J. H. C. Smith, and H. W. Milner** (*Carnegie Inst. Wash. Yearbook 27 (1927-28), pp. 175, 176, fig. 1*).—Through improvements in extraction and purification technic, yields of pure pigments have been materially increased. This advance is particularized, along with results of reinvestigation of the molecular weight of carotene (which is of primary importance for future work), and determination of the absorption spectra (in the visible region) of carotene and of xanthophyll. It was found that few of the methods and solvents in general use for the determination of the molecular weight of organic compounds gave reliable results. Some new values are indicated.

**Tomato color as related to quality in the tomato canning industry, J. H. MacGillivray** (*Indiana Sta. Bul. 350 (1931), pp. 35, figs. 11*).—Following a summary discussion of the evaluation of color in terms of hue, value, and chroma and some notes on the importance of the nature of the illuminant in color evaluation, the bulletin takes up the influences affecting the color of the raw fruit and the effects of treatments used in the preparation of canned tomatoes and tomato products. The color measurements made demonstrated that "the color of the raw stock is primarily dependent upon the care in picking. . . . Environmental conditions are probably secondary in importance as affecting color. Data are given to show that raw stock of high quality will give a finished product of good color.

"Heating causes an impairment of tomato color with raw cyclone juice or canned tomatoes. It seems likely that the greatest part of the color change occurs in the first portion of the heating period. Tomato pulp suffers a large impairment of color in the first fourth of the concentrating period when open tanks are used. Attention is called to the effect of dilution of pulp with water, temperature, sugar, carmine No. 40, iron and copper salts, and paprika on the color of tomato pulp." Sugar improved the hue but detracted from the chroma quality of the color. Carmine No. 40 could be used to improve both hue and chroma. Small proportions of ferrous, ferric, cuprous, or cupric salts all had the effect of a "very serious impairment" of the color. By the addition of 0.5 per cent of paprika both hue and chroma could be improved. Acetic acid, as vinegar, affected the color much as did the sugar.

Color conversion tables are included.

**On the applicability of chromium steel vessels to analytical purposes** [trans. title], A. KRÜGER (*Chem. Ztg., 55 (1931), No. 71, pp. 682, 683*).—A chromium steel casserole was tested for resistance to potassium hydroxide solutions of 1, 5, and 10 per cent concentrations held 20 minutes at the boiling point, to 1 and 5 per cent potassium hydroxide containing hydrogen peroxide and held 20 minutes at 70° C., to 1 per cent potassium hydroxide containing sodium sulfide, to 1, 5, and 10 per cent potassium carbonate, to ammonium hydroxide of a strength of 5 per cent $NH_3$, to an ammonium sulfide solution, to the alkaline tartrate solution of the Fehling reagent, and to barium hydroxide solution. In all cases except those of the two solutions already containing sulfide, test for the presence of dissolved iron was made by adding sodium sulfide solution. By comparison of the colors produced in these tests with those of similar alkaline solutions to which had been added known small quantities of iron in the form of ferric chloride, it was concluded that 200 cc. of the 5 per cent and of the 10 per cent potassium hydroxide solutions dissolved, under the conditions above specified, 0.1 and 0.2 mg., respectively, of iron.

It is pointed out that such chromium steel vessels might be used with advantage in certain analytical operations involving strongly alkaline solutions and in which silica would be brought into the solution from glass, and both silica and aluminum from porcelain vessels. As an example of the results of analytical operations in chromium steel the following figures from determinations of iron and of aluminum as the oxides are given: In the iron determinations the calculated iron contents of the test solutions were 0.1030, 0.1384, and 0.1290 gm., and the respective quantities found after precipitation in the chromium steel casserole were 0.1026, 0.1382, and 0.1288 gm.; while in the aluminum determinations the figures were, for the theoretical content of the test solutions calculated as oxide, 0.1408, 0.1479, and 0.1445 gm., respectively, as against corresponding analytical findings after precipitation in the chromium steel vessel of 0.1413, 0.1482, and 0.1440 gm.

**Apparatus for percolation at a uniform rate and automatic collecting device**, P. L. HIBBARD (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 4, pp. 404, 405, fig. 1*).—The apparatus described in this contribution from the California Experiment Station was designed to permit percolation of a small amount of soil (20 gm.) with an aqueous solvent at a uniform rate of flow (about 40 drops a minute) continued for 15 to 30 hours, without attention after it is set in operation. After the first receiver of the percolate is filled, the flow is automatically shifted to the next receiver till a whole series has been filled without any personal attention. A detailed description is accompanied by a diagram.

"The reason for making this somewhat complicated regulating device is that it was not found possible to secure a constant flow at a uniform rate by any simpler contrivance which would continue to flow indefinitely at a slow enough rate. Stopcocks partly closed, pinch clamps on rubber tubing, capillary tubes, ordinary siphons of small diameter—all failed when made to run slowly enough for the purpose in question."

**Effect of degree of pulverization and weight of samples on quantitative analyses,** R. C. Malhotra (*Indus. and Engin. Chem., Analyt. Ed.*, *2* (*1930*), *No. 4*, *pp. 398–401*).—As a result of a study carried out at the University of Chicago, "the data indicate that for practical purposes material passed through 60-mesh sieve is satisfactory to use. The data also point out that, for the tissues studied, from 3 to 4 gm. of material are most desirable. Less than this amount and larger than 6 gm. do not seem to be satisfactory."

Some possible explanations of such results are given.

**Bacterial cataphoresis** (*Pennsylvania Sta. Bul. 266* (*1931*), *p. 8*).—A new form of the Falk cataphoresis cell, devised by M. E. Smith and M. W. Lisse, was shown to be free from several of the sources of error which had been found to be inherent in the older type.

"The extent of these errors, due to variations in technic and apparatus, is deduced theoretically and proved experimentally, with good agreement, for the following cases: (1) Centering the capillary, (2) position of the electrodes with respect to the ends of the capillary, (3) size of wire electrodes, and (4) depth of filling of cell. Because of these and other advantages, the new type cell is better adapted for determining the comparative cataphoretic velocities than is the old type Falk cell."

**A simple electrodialysis cell for the routine determination of exchangeable bases in soils,** M. L. M. Salgado and G. W. Chapman (*Soil Sci.*, *32* (*1931*), *No. 3*, *pp. 199–215*, *pl. 1*, *fig. 1*).—The authors of this contribution from the University of Cambridge, England, find the various types of electrodialysis cells so far developed unsatisfactory for routine work and the cost of the apparatus high. A simple and cheap two-compartment continuous-flow type of electrodialysis cell, well suited for routine determinations of the exchangeable bases of soils, is described, a special type of filtering crucible being used as the anode chamber, with a filter plate made of sintered glass powder as the dialyzing membrane. The cost of the apparatus is greatly reduced by the use of a plane spiral of gold wire as the anode, and by the elimination of the outer chamber, copper gauze being used as the cathode.

"The cell is easily constructed and has the following advantages: The soil layer is thin. There is no endosmotic flow of water through the sides, as these are of glass. The distance between the electrodes is short. The soil can be washed free of soluble salts before electrodialysis. Concentrated dialyzates are obtained. The cell can be easily cleaned. There is practically no rise in temperature during dialysis. Complete dialysis can be effected in 6 to 10 hours. A set of 10 cells complete with electrodes can be fitted up for about $20."

The results of parallel determinations in four types of soil by normal ammonium acetate displacement and by electrodialysis in the new type of cell show very satisfactory agreement.

**The alcohol method for determining moisture content of soils,** G. Bouyoucos (*Soil Sci.*, *32* (*1931*), *No. 3*, *pp. 173–179*, *pl. 1*).—In a contribution from the Michigan Experiment Station the author reports that "the alcohol method for determining moisture content of soils very rapidly has been reinvestigated. The results obtained go to show that if the method is properly used it is accurate and reliable. The method can determine the moisture content of soils in about 5 minutes in the case of light-textured soils, and in about 12 minutes in the heaviest clays.

"A new feature is introduced in the method, whereby the soils are dispersed mechanically by means of the milk shaking machine. By tying a spring to the paddle of the stirring rod, even the heaviest clay can be reduced to the particle state in a few minutes."

**The use of hydrogen peroxide for estimating humification, H. L. Richardson** (*Soil Sci., 32 (1931), No. 3, pp. 167–171*).—The author of this contribution from the Rothamsted Experimental Station treated a variety of undecomposed plant materials with 6 per cent hydrogen peroxide as in the estimation of the " degree of humification " of the organic matter content of soils, finding the loss in weight of these materials to range from 19 per cent in the case of straw to 61 per cent in that of mustard, while in the presence of soil the losses were increased, ranging from 21 per cent (straw) to 70 per cent (sphagnum). " With most materials, however, a great part of the effect of the peroxide reagent was simply solvent action, that is to say, treatment with water alone under the conditions of the method caused considerable losses and the extracted residues were more resistant to peroxide. With two exceptions (sphagnum, 49 per cent, and mustard, 31 per cent) none of the residues after water extraction lost more than 16 per cent of their weight under peroxide treatment "; but the effect was sufficient to lead to the conclusion that " from the point of view of its action on undecomposed materials the 6 per cent peroxide method can give only approximate results, and it is inadvisable to use it for comparing materials of widely differing origin."

**Titration of lead by means of a thermionic titrometer, R. W. Gelbach and K. G. Compton** (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 4, pp. 397, 398, figs. 2*).—With respect to requirements which apparatus of the type under consideration should be expected to meet, it is the opinion of the authors of this contribution from the Washington State College that " an ideal potentiometric titration apparatus should indicate the equivalence point—i. e., where $\Delta E/\Delta V$ becomes a maximum—without the necessity of constructing a curve." Of the set-up diagrams of the electrical connections which are here given, it is stated that " a device sufficiently sensitive to changes in potential to show a large change in the deflection of the indicating instrument, thus showing the approach and location of this point, has been constructed." A 3-tube circuit employing 3 UX 201A 3-element tubes, and a 2-tube circuit using 1 UX 222 screen grid with 1 UX 201A are both shown. The titration was performed with 0.1 N potassium chromate solution. Data of 7 titrations of 50 cc. of 0.05 N lead nitrate show a maximum deviation from the theoretical quantity of +0.025 cc. of the potassium chromate solution, minimum 0.005 cc.

**Titration of lead salts, R. C. Wiley, P. M. Ambrose, and A. D. Bowers** (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 4, pp. 415, 416*).—A modification of the titration of lead by precipitation with a standard molybdate solution, the principal change consisting in the substitution of a saturated solution of pyrogallol in chloroform for the stannous chloride-thiocyanate solution as indicator for the molybdate ion, is proposed in this communication from the University of Maryland, the pyrogallol-chloroform reagent being used on the spot plate as an outside indicator.

" This pyrogallol-chloroform solution is very sensitive to a small amount of the molybdate ion. . . . One drop of a 0.000005 N molybdate solution will cause a distinct brown coloration.

" The method herein described may be used for the titration of lead salts directly or the titration of lead acetate formed by the solution of lead sulfate in the usual method of lead determination. The pyrogallol-chloroform indicator, unlike the stannous chloride-thiocyanate indicator, may be used in the presence of large amounts of ammonium acetate in titrating lead salts. . . .

"The lead solution to be titrated should contain no other metals forming insoluble molybdates. It should be neutralized with ammonium hydroxide and any precipitated lead hydroxide dissolved by boiling with ammonium nitrate. The solution must be boiled until neutral and titrated with standard molybdate while hot. The end point is reached when a drop transferred to a spot plate containing the pyrogallol-chloroform indicator is colored brown."

It is considered, further, that "since many molybdates are insoluble, the indicator herein described should form a basis for other volumetric molybdate methods. It might also form the basis for the determination of molybdenum colorimetrically." An aqueous solution of pyrogallol was found much less sensitive as an indicator for the presence of the molybdate ion than the solution in chloroform.

**Method for estimating aldose sugars by titration with iodine and alkali,** C. S. Slater and S. F. Acree (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 3, pp. 274–276*).—The investigation dealt with in this contribution from the U. S. Bureau of Standards showed that under specified conditions aldose sugars react quantitatively with two equivalents of iodine, forming two equivalents of hydriodic acid and one of the aldonic acid. By neutralizing the sugar solution and adding both standard iodine and alkali in several portions until a small excess of each is present, and allowing the mixture to stand about 15 minutes, the excess of iodine could be determined by means of standard thiosulfate and that of alkali by standard acid. "The aldoses, glucose, lactose, galactose, and xylose use or remove two equivalents of iodine and three of alkali, whereas xylans, galactans, fructose, and sucrose remain practically unchanged."

**Estimation of aldose sugars by titrating with standard iodine and alkali,** G. M. Kline and S. F. Acree (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 4, pp. 413–415*).—In the article above noted the reagents were added comparatively rapidly in single portions and in considerable excess, and an accuracy of about 2 per cent was obtained. Further studies are now reported on various factors affecting the titration, such as the mode of addition of the reagents, iodate formation, hydrogen-ion concentration, oxidation of the aldonic acid and of ketones and nonreducing sugars, and the time of oxidation. "By adding the standard iodine first and then the alkali, each in small fractions of the total volumes required, the reaction is completed rapidly and a precision of 0.2 to 0.3 per cent is obtained. Iodate formation is an index of the completion of the oxidation of the aldoses."

The detail of the procedure is given.

**[Fat determinations in dairy products]** (*Pennsylvania Sta. Bul. 266 (1931), pp. 23, 24*).—Two methods are presented.

*An improved method for testing ice cream and ice cream mix for fat,* W. D. Swope et al.—A method for testing the fat content of ice cream and ice cream mixes which checks very closely with the Mojonnier test consists of weighing out a 9-gm. sample, adding 1 cc. of ammonium hydroxide and 3 cc. of butyl alcohol, shaking thoroughly, adding 17.5 cc. of diluted sulfuric acid, and centrifuging. A clearer fat column is obtained if the temperatures of the sample and the acid are between 85 and 100° F. The fat column is read from the bottom of the lower to the bottom of the upper meniscus or by the use of glymol.

*A fat test for chocolate milk,* F. J. Doan and D. E. Molyneaux.—A test recommended for determining the fat content of chocolate milk consists of using 9 gm. of samples in an 8 per cent milk bottle, 3 cc. of 27 per cent ammonia water, 5 cc. of butyl alcohol, and 17.5 cc. of diluted sulfuric acid. The test does not distinguish between butterfat and cocoa fat, but the total fat agrees with the Roese-Gottlieb-Mojonnier method to within 0.1 per cent when the fat contents range between 0 and 5 per cent.

**The estimation of salt and molasses in mixed feeds,** G. S. Fraps (*Texas Sta. Bul. 425 (1931), p. 12*).—The abstract of this bulletin (E. S. R., 65, p. 615) failed to emphasize the evident necessity, as indicated in the bulletin, when estimating molasses content from the invert sugar figure to correct for the sugar content of the feed.

**Determination of sulfur in insecticides and fungicides by carbon disulfide extraction,** R. Edge (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 4, pp. 371–373*).—The U. S. D. A. Food, Drug, and Insecticide Administration reports the observation that samples of insecticidal and fungicidal dusts frequently contain sulfur as flowers of sulfur, much of which may be insoluble in carbon disulfide. A method was therefore developed whereby all the free sulfur could be converted, practically without loss, to the carbon disulfide soluble form by means of controlled heating. In this form it was readily determined by carbon disulfide extraction.

**Determination of boron in natural waters and plant materials,** L. V. Wilcox (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 4, pp. 358–361, fig. 1*).—The procedure detailed in this contribution from the U. S. D. A. Bureau of Plant Industry differs from that of Chapin (distillation of the boric acid as methyl borate, alkali hydrolysis of the ester, titration of the neutralized solution after addition of mannite) "chiefly in the employment of copper flasks and beakers and of Kavalier Bohemian glass flasks for the hot alkaline solutions. Copper beakers are used for the first concentration of the water sample, which must be kept alkaline to prevent the loss of boron by volatilization. Copper Kjeldahl flasks are used when separating the methanol from the alkaline distillate, and finally copper beakers are used in drying and igniting the alkaline residues from the Kjeldahls. This ignition appears to be essential in order to oxidize the organic matter of the distillate that would otherwise interfere with the titration. . . . When copper apparatus is not used the blank determinations are high and erratic, but with copper apparatus consistently low blanks are obtained."

## METEOROLOGY

**The influence of wave length transformation on the climate of air layers near the soil and on the temperature of the free air** [trans. title], G. Falckenberg (*Met. Ztschr. [Brunswick], 48 (1931), No. 9, pp. 341–346, figs. 3*).—The cooling of air layers near the soil in the evening and at night is ascribed to the influence of the soil in changing the wave length of the dark rays and the absorption of infra-red rays by the air. The influence of wave length transformations by clouds on the temperature of the free air is also discussed.

**The utility of long periods of observations on rainfall in a given place** [trans. title], E. Mathias (*Compt. Rend. Acad. Sci. [Paris], 193 (1931), No. 16, pp. 623–626*).—From a study of rainfall observations on Puy de Dôme, the author concludes that there is a direct and significant relation between deforestation and decrease in rainfall and that reforestation has been followed by an increase in rainfall.

**Climatological study of the development of winter wheat** [trans. title], H. Geslin (*Ann. Agron. [Paris], n. ser., 1 (1931), No. 5, pp. 695–721, figs. 8*).—In line with ideas advanced by V. Ducomet and C. Crépin[1] regarding methods of investigation in agricultural meteorology, the author studied the relation of temperature and depth of planting to germination of wheat and of temperature and length of day to growth of wheat seedlings under controlled conditions. From the results he derived curves and formulas which show definite and uniform correlations between cause and effect and appear to establish a law of growth. The results indicate the value of such methods of investigation.

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[1] Ann. Sci. Agron. Franç. et Étrang., [44] (1927), No. 1, pp. 1–20, pl. 1.

A number of references to literature relating to the subject are given.

**Cotton growing in India in relation to climate,** T. Trought and M. Afzal (*India Dept. Agr. Mem., Bot. Ser., 17 (1930), No. 5, pp. 117–136, figs. 7*).—This paper gives the results of a study of climatic conditions in typical cotton-growing areas of India. Tables and diagrams show normals for maximum and minimum temperature, monthly rainfall, number of rainy days per month, monthly amount of cloud, mean relative humidity at 8 a. m., and mean velocity of wind in miles per hour. The greatest similarity of conditions was found to be during the middle of the picking season. "Rainfall is low in the later half of the growing and throughout the picking seasons. Relative humidity varies enormously at different places during the course of the year."

**Reactions of atmospheric conditions in 1930 on southern vineyards** [trans. title], L. Chaptal (*Ann. Ecole Natl. Agr. Montpellier, n. ser., 21 [1931], No. 1, pp. 20–27, figs. 2*).—It is shown that the excessive rainfall and humidity of the season lowered the temperature and favored the development of mildew. In general, however, there was a certain parallelism between growth and yield in 1930 and in previous years, indicating that excess of humidity compensated for lowered temperature during the year.

**Climates,** C. F. Jones (In *South America. New York: Henry Holt & Co., 1930, pp. 30–49, 727, 728, figs. 12; abs. in Bul. Amer. Met. Soc., 12 (1931), No. 11, pp. 196, 197*).—This chapter of a general geography of South America describes the climate of each of the 43 subdivisions of the continent, with special emphasis on those features which bear most directly on economic conditions and life of each region. Averages of temperature and rainfall and departures from them are given, and the controlling factors are discussed. Fourteen different types of climate are recognized, described, and illustrated. The marked effect of altitude on temperature and precipitation as related to agriculture is brought out. A bibliography of the subject is given.

**Meteorological observations, [September–October, 1931],** C. I. Gunness and K. M. Wheeler (*Massachusetts Sta. Met. Ser. Buls. 513–514 (1931), pp. 4 each*).—Summaries of observations at Amherst, Mass., during September and October, 1931, are given, with normals and extremes for these months during previous years.

## SOILS—FERTILIZERS

**[Soil Survey Reports, 1928 Series]** (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 9, pp. 26, fig. 1, map 1; 10, pp. 37, fig. 1, map 1*).—These reports were prepared with the cooperation of the University of Nebraska State Soil Survey Department of the Conservation and Survey Division.

No. 9. *Soil survey of Pierce County, Nebraska,* A. W. Goke and W. H. Buckhannan.—Pierce County covers 364,800 acres of broad plain in northeastern Nebraska, its lands characterized by minor relief, brought about by stream and wind action, and good drainage. Of the total area of Pierce County, 92.8 per cent is in farms.

Moody very fine sandy loam, Dickinson loamy sand, and Valentine sand with 20.8, 15.1, and 11.3 per cent, respectively, of the total area lead in areal importance among the 25 types of 18 series here mapped and described.

No. 10. *Soil survey of York County, Nebraska*, F. A. Hayes and A. W. Goke.—York County, southeastern Nebraska, includes 368,000 acres of the loess region of the State, about 85 per cent of the county area being upland, the remainder alluvial land of the broad shallow valleys. The county is very generally well drained.

Hastings silt loam, one of the most highly productive soils of the county, covers, with the inclusion of a slope phase, 81.0 per cent of the entire area. The complete classification also includes 12 other series.

**Soil survey of Belmont County, Ohio,** S. W. Phillips et al. (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpt.*], *Ser. 1927, No. 17, pp. 25, fig. 1, map 1*).—Belmont County, eastern Ohio, possesses a land area of 344,960 acres. Though largely of a hilly relief, it contains also areas ranging from strongly rolling to smooth. "Belmont County is well drained through natural surface drainage ways which extend to all parts of the uplands."

The soils found in the survey here recorded are mapped and described as 16 types, representative of 11 series, together with 0.1 per cent of unclassified material, the important areas being those of Westmoreland silty clay loam, which occupies 66.3 per cent of the total area examined, and Muskingum silt loam, which covers a further 19.1 per cent. pH determinations are included.

The survey was made in cooperation with the Ohio Experiment Station.

**The soils of Texas,** W. T. Carter (*Texas Sta. Bul. 431* (*1931*), *pp. 192, figs. 90, map 1*).—"Nearly 80 per cent of Texas" having been reached "by some form of soil survey work," the present knowledge of the soils of the State, together with soil studies made in unsurveyed areas, has provided sufficient information to permit the preparation of a general soil map of Texas, together with brief descriptions of the soil regions and of the principal soils.

"Nearly 100 of the most important series of soils that occur in the State are described briefly . . . and these, with the map, give in generalized form an outline of the present information relating to soil classification and soil values."

**The chemical composition of soils of Cameron, Coleman, Dallas, Erath, Harris, Reeves, Rockwall, and Tarrant Counties,** G. S. Fraps (*Texas Sta. Bul. 430* (*1931*), *pp. 83*).—This bulletin contains detailed analyses of the various types of soils found in the counties named. Tables interpreting the analyses are also given, together with the results of pot experiments designed to test the fertility of the soil.

"The black prairie soils are found to be richest in plant food and well supplied with lime, while the forested upland soils on an average are lowest in phosphoric acid, nitrogen, potash, and lime, and in some cases are slightly acid. The first-bottom soils are usually well supplied with plant food and with lime."

For each county, tables are given showing the analyses of the various types of soils, the pot experiments, and the interpretation of the analyses, for each individual soil type.

**[Soil chemistry and soil moisture studies],** R. Fernández García and L. R. Serrano (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1930, Eng. ed., pp. 36, 37, 140, 141; also in Porto Rico Commr. Agr. and Labor Rpt. 1930 Spanish ed., p. 181*).—Soil work for the year is here reported.

*Reclamation of alkali soils.*—"Sulfur, salts of calcium, and cane trash either alone or in combination and in various amounts were applied to a tract of alkali soil of Mercedita clay supplied with tile drainage. Although the water used for leaching was rich in soluble salts, analysis of soluble salts showed they were washed downward. A legume crop gave the best yields in the plats receiving sulfur or cane trash either alone or in combination. It should be noted Mercedita clay is rich in calcium carbonate."

*Nitrification in the presence of cane trash.*—"Due to the necessity of using cane trash in greater proportion than was used in the field studies, accumulation of nitrates was very slow."

*Movement of the water in the soil.*—The method is outlined and the apparatus used is briefly described, the average percentages of moisture in samples taken at 4-in. depth intervals from 4 to 32 in. and at 4, 16, and 24 hours, 3, 7, 15, and 32 days after irrigation, together with one sampling before irrigation, being tabulated.

**Some nitrogen relationships in muck soils,** B. D. Wilson and G. R. Townsend (*New York Cornell Sta. Mem. 137 (1931), pp. 14, figs. 2*).—By means of field and laboratory experiments it was shown that muck soils accumulate nitrate nitrogen rapidly, the nitrate concentrations often reaching a considerable magnitude. Larger accumulations were found in newly cleared muck than in that which had been cropped annually for more than 20 years.

"Whether a relationship was found between the acidity of the soils and their content of nitrate nitrogen depended on the depth to which the samples were taken. It is obvious, therefore, that the method of sampling deserves serious attention in the study of muck soil. The seasonal fluctuations that were observed in soil reaction were induced by the drying of the soils, or the attendant processes, rather than by the quantity of nitrate nitrogen present in the soils.

"The biological decomposition of the organic matter characteristic of muck soil did not inhibit the presence of large quantities of nitrate nitrogen in the soil. The incorporation of plant tissue in the form of timothy or clover hay was found to depress nitrate accumulation. Its action was more apparent in muck soil that had been cultivated than in virgin muck soil. Timothy was more effective than was clover in depressing nitrate accumulation, and exerted its influence for a longer time. This is in accord with the findings that have been reported for mineral soils.

"The extent to which nitrate accumulated in the soils of the investigation suggests that the large quantities of nitrogen which are often applied to muck soils may be excessive, and possibly injurious to the proper development of certain crops. This would apply particularly to newly cleared mucks."

**The fixation of nitrogen by leguminous plants under bacteriologically controlled conditions,** P. W. Wilson, E. W. Hopkins, and E. B. Fred (*Soil Sci., 32 (1931), No. 4, pp. 251–269, pl. 1, figs. 2*).—The authors of this contribution from the University of Wisconsin found the root-nodule bacteria of clover and of alfalfa able to fix nitrogen, in conjunction with the proper host plant, in an agar substrate under conditions excluding other organisms. It is noted, however, that the presence of "ordinary air contaminators" did not appear in any way to affect the fixation.

"The quantity of nitrogen fixed in an agar substrate in bottles closed with cotton plugs varied from 2 to over 10 mg. per 10 plants. The quantity of nitrogen fixed appears to be dependent on the general growth of the plant. Under the experimental conditions employed the plant growth is limited more by factors such as light, gas exchange, and transpiration than by a need for nitrogen, hence the latter is the dependent variable rather than the independent one. There was evident an increase in the nitrogen fixed by plants from unsterilized seeds or inoculated with unsterilized nodule cultures. However, this increase may be due to effects tending to give increased plant growth rather than to the presence of other organisms as such.

"The effect of inoculation with good and poor strains was demonstrated under conditions that excluded any chance contamination. The use of the agar culture technic for differentiating efficiencies of a number of strains is apparently limited to extremes of 'good' and 'poor,' since factors other than need for nitrogen influence the growth of the plants to an extent that small differences in nitrogen-fixing ability are masked."

**Manganese in Texas soils and its relation to crops, E. C. Carlyle** (*Texas Sta. Bul. 432 (1931), pp. 37*).—In most of the 21 soils tested the manganese content appeared adequate without additions of this element, and in 6 of the soils decrease in yield indicated that the additions made had raised the manganese content to a toxic concentration. In 1 soil producing chlorotic sorghum, manganese treatment gave a decided increase in growth.

Corn and cotton took up from quartz sand about 10 per cent of the manganese supplied. The correlation between manganese supply and its absorption by plants was found less than that existing between supply and absorption of active phosphate and potassium. "The application of a fertilizer containing nitrogen, phosphoric acid, and potash increases the percentage of manganese in the crop 30 to 70 per cent."

Analyses of the manganese contents of a number of soils, crops, and plant products of the State are given. It is stated that "while some Texas soils contain only small percentages of manganese, the requirements of the plant are so small that the soil is much better supplied with manganese than with nitrogen, phosphoric acid, or potash."

**[Soil investigations of the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 13–39, 64, figs. 10*).—This continues previous reports (E. S. R., 64, p. 808).

[*Soil, fertilizer, and rotation experiments*].—Results of drainage-water studies, fertilizer and rotation trials, tests of legumes in grain farming, a score card for judging agricultural limestone, comparisons of rock phosphate and superphosphate, tests of the need of some Illinois soils for potash, and studies of seasonal conditions as influencing benefits from legumes are reported.

*Score card set up for judging agricultural limestone.*—It is stated that "the score card [the work of DeTurk and Bray] deals with the preparation of the material. The purity, which is at least an equally important factor, is considered independently. Limestone that is fine enough to pass through a 28-mesh Tyler sieve will become effective in approximately a year, and this size of material is rated at 100. Finer material is given a slightly higher rating, and the coarser material is rated lower, the ratings falling off very rapidly toward the coarser end. Particles coarser than 2-mesh (½-in.) are discounted by a negative valuation because they may damage the spreader and thus be a liability to the purchaser."

*Single limestone application gives lasting results.*—"It is indicated [by work of F. C. Bauer et al.] that when enough limestone is applied to satisfy the demands of the most lime-exacting legumes, there need be no further applications for a period of 8 to 10 years. These data indicate that much may be gained by giving the soil a second treatment after this period."

*Marked crop increases feature phosphate experiments.*—"A novel feature of these experiments [conducted by F. C. Bauer et al.] was the small size of the plats. This experiment was designed to take the place of greenhouse pot-culture experiments. A strip of land 80 in. wide was carefully selected for soil uniformity. It was plowed and carefully worked down with a slight crown in the center. Wheat was seeded on this strip with a regular 80-in., 10-disk wheat drill. The horses were kept off the strip by using a wide hitch. After the wheat was seeded, plats 48 in. wide and 80 in. long were laid off. Boards pressed down into the soil were placed between each plat to prevent washing from one to another. The proper amount of phosphatic fertilizers were then carefully applied to the plats and raked in by hand with a garden rake. At harvest time 10 sq. ft. of the crops were removed from the center of the plat for yield determinations."

*Straw residues may cause some loss of nitrogen.*—"Results of the past year [obtained by O. H. Sears and L. E. Allison] indicate . . . that at least some of the nitrogen changed from the nitrate form may be lost. . . . Recent evidence indicates that the mineral substances, as well as the organic part of the straw, supply food for the organisms."

**[Fertilizer investigations of the Idaho Station]** (*Idaho Sta. Bul. 179 (1931), p. 19*).—Work with sulfur and sulfates (gypsum) indicates that "sulfur in some form is essential for maximum yields of legumes in the cut-over areas." Also, "gypsum is superior to other materials for maintaining crop yields on the St. Joe bottoms."

Phosphates and potassium appeared the limiting factors on the peat lands of Bonner and Boundary Counties, and phosphates improved crop yields in the irrigated areas.

**Chemical nature and solubility of ammoniated superphosphates and other phosphates, K. D. Jacob and W. H. Ross** (*Jour. Amer. Soc. Agron., 23 (1931), No. 10, pp. 771–787, fig. 1*).—The authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., present a summary of the reactions possible in the ammoniation of superphosphates in commercial practice, together with data on the effect of these reactions on the solubility of the phosphate content of the product in ammonium citrate solutions. Criticisms of the present Official method for the determination of citrate soluble phosphoric acid are also put forward, with a modification offered as obviating the main difficulties encountered.

"Because of the presence of tricalcium phosphate, the citrate solubility of the phosphoric acid in heavily ammoniated superphosphate varies with the weight of sample taken for analysis, and the results obtained on such materials by the present Official method are not in good agreement with the results of vegetative tests. It has been proposed to change the Official method so that it will better evaluate ammoniated superphosphates and certain other phosphatic materials. The proposed change involves reducing the sample from 2 gm. to 1 gm. and increasing the time of digestion from 0.5 hour to 1 hour. . . .

"The citrate solubility of tricalcium phosphate in a mixed fertilizer may be considerably lower than that of the pure salt because of the effect of other compounds, such as calcium carbonate and calcium sulfate, in depressing its solubility."

**The movement and fixation of phosphates in relation to permanent pasture fertilization, A. R. Midgley** (*Jour. Amer. Soc. Agron., 23 (1931), No. 10, pp. 788–799, fig. 1*).—The author presents a record of experiments at the Wisconsin Experiment Station, including (1) field studies of the use of phosphatic fertilizers, (2) plant response from different methods of applying superphosphate to grasslands and cultivated crops, (3) chemical analyses of soil samples taken at various depths to determine the movement of superphosphate under field conditions, (4) studies of the comparative movement and fixation of different phosphates under controlled laboratory conditions, and (5) studies of the influence of various fertilizing materials on the penetration of superphosphate.

"These studies indicate that superphosphate when applied as a surface dressing moves downward very slowly. Most of the phosphate was found within the surface inch of soil even after an interval of six months. Maximum results can not be obtained immediately unless the phosphate is thoroughly mixed with the soil. Superphosphate worked into an old established bluegrass sod gave a total increase of 71.5 per cent more than a similar amount of superphosphate applied on the surface.

"There is a very marked difference in the behavior of different phosphatic salts as to their movement through soils. From a ¾ in. layer of Carrington silt loam held on a Buchner funnel, none of the phosphate in superphosphate was removed by leaching with 750 cc. of water. In the cases of sodium phosphate, ammonium phosphate, and potassium phosphate, 88, 3.3, and 3.2 per cent, respectively, of the phosphates were leached out.

"Alternate wetting and drying is one of the most important factors in the fixation of phosphates in soils. When the phosphates were mixed with ¾ in. of soil, their solubility was reduced nearly one-half by each successive wetting and drying treatment. A comparison of the different phosphates shows that superphosphate is fixed fully 30 times more readily than sodium phosphate by the wetting and drying treatments.

"Fertilizer salts mixed with superphosphate greatly influence the movement of the latter through soils. Sodium nitrate increased the movement of superphosphate, while potassium and ammonium sulfate slightly decreased it."

**Phosphate penetration in field soils, R. E. Stephenson and H. D. Chapman** (*Jour. Amer. Soc. Agron., 23 (1931), No. 10, pp. 759–770*).—Aqueous and acid extracts of soils which had had from 1 to 30 or more annual applications of phosphatic fertilizers were compared by the authors of this contribution from the University of California Graduate School of Tropical Agriculture with similar soils not phosphate treated, the results showing an "appreciable penetration of the phosphate below the surface foot in light- to medium-textured soils. Little or no penetration was found to have taken place in very heavy soils," however.

Further observations were that "after 22 annual applications there was no evidence of phosphate penetration below 12 in. in plats receiving bone meal, as compared with marked penetration in plats receiving superphosphate and manure. There are indications that the phosphorus in manure moves readily through the soil or else some effect of organic matter facilitates the more rapid penetration of phosphorus. In nearly all of the soils receiving phosphate over a period of years, there has been a marked accumulation in the surface 6 to 12 in."

**New fertilizer materials, A. R. Merz** (*U. S. Dept. Agr. Circ. 185 (1931), pp. 15, figs. 2*). Commercial processes for fixing atmospheric nitrogen for fertilizer purposes are outlined briefly, and various factors that have played a part in increasing the concentration of fertilizers are discussed. Advantages and disadvantages of concentrated fertilizers are considered briefly.

The use of ammonia, the product of the synthetic ammonia process for fixing nitrogen, in the ammoniation of superphosphate is described, and brief accounts are given of the preparation, plant-food content, and properties of the various salts and compounds into which it is converted for fertilizer purposes, including ammonium sulfate, ammonium chloride, Potazote, monoammonium phosphate, Ammo-Phos, diammonium phosphate, Leunaphos, ammonium nitrate and its mixtures with calcium carbonate, Leunasalpeter, potassium ammonium nitrate, sodium nitrate, calcium nitrate, potassium nitrate, urea and its compounds, Phosphazote, treble superphosphate, Nitrophoska, and Ammo-Phos-Ko.

**Analyses of commercial fertilizers,** H. E. Curtis, H. R. Allen, and L. Gault (*Kentucky Sta. Bul. 313 (1930), pp. 629–723*).—The usual analyses are reported. .

**Inspection of fertilizers,** W. L. Adams, D. R. Willard, and A. S. Knowles, jr (*Rhode Island Sta. Ann. Fert. Circ., 1931, pp. 17*).—Out of 185 brands, representing the goods of 48 makers, the largest group of products examined in Rhode Island for some time, "the percentage of failures to meet guaranties is the smallest in the past 10 years and probably in the history of the inspection service," 93 per cent of the materials, as shown by the analyses reported, meeting guaranties fully while only 3 per cent failed by as much as 0.30 per cent.

**Commercial fertilizers in 1930–31 and their uses,** G. S. Fraps and S. E. Asbury (*Texas Sta. Bul. 434 (1931), pp. 47*).—The bulletin consists of the usual annual fertilizer analyses and related information, including a discussion of the use of fertilizer for various crops and sections.

"Sales of fertilizer decreased over 50 per cent, and the use of fertilizer on cotton apparently decreased much more than 50 per cent."

## AGRICULTURAL BOTANY

**Plant succession and indicators: A definitive edition of plant succession and plant indicators,** F. E. Clements (*New York: H. W. Wilson Co., 1928, pp. XVI+453, pls. 44, figs. 24*).—This is a combined, condensed edition of Plant Succession (E. S. R., 37, p. 434) and Plant Indicators (E. S. R., 45, p. 525).

"It has been necessary to disregard the large amount of new material as well as to omit considerable portions of the text in order to bring the two books within the compass of one volume. The comprehensive nature of the treatments makes it possible to do this without serious harm to the main themes, and especially since the portions omitted are to be expanded into as many collateral books with a full account of the researches since 1914."

**Aims and plans of the investigations [in experimental taxonomy],** H. M. Hall, D. D. Keck, and W. M. Heusi (*Carnegie Inst. Wash. Yearbook 27 (1927–28), pp. 183–187*).—The results are given of an intensive study (E. S. R., 59, p. 125) of Haplopappus and of similar studies initiated for Potentilla, Pentstemon, and Zauschneria. Some of the preliminary results for the year are said to show that plants brought from 9,000 ft. elevation in the Sierra Nevada Mountains to sea level at Berkeley bloom a month ahead of their scheduled time, retain the stature and reduced flower number of alpine dwarfs, but form broader mats. Those brought from 5,000 ft. elevation show increased vegetative growth, intensified flower color, and lengthened flowering period.

**Living cells two and half centuries old,** D. T. MacDougal and J. G. Brown (*Carnegie Inst. Wash. Yearbook 27 (1927–28), pp. 169, 170*).—This continuation of the study of long-lived plant cells (E. S. R., 58, pp. 319, 521; 59, p. 122), made chiefly to ascertain what protoplasmic changes progress with age and how environment may factor in such changes, made use of the desert tree *Parkinsonia microphylla*.

Stem sections 10 cm. in diameter and over 75 years old showed occasional living ray cells near the center, also tracheids or wood fibers in which the nucleus and cytoplasm were normal and active. An older excentric leaning trunk showed a 9-cm. thickness of moist wood in the flank, and several counts of layers credited to F. Shreve indicated an age of 275 to 300 years. Living ray cells and tracheids near the center, visible without staining and with a dry objective, are considered as at least 250 years old. Living tracheids were numerous even in the oldest part of the stem. No observations have been made as to the length of the period of enlargement of these elements, but as the season's growth of this desert tree is completed during the brief summer rains, this enlargement is supposed to take place in less than a week. The existence of these elements (12,000 or 13,000 weeks) thus records a new ratio between the period of development and that of mature existence. Other cases are discussed.

**Long-lived cells of the redwood,** D. T. MacDougal and G. M. Smith (*Carnegie Inst. Wash. Yearbook 27 (1927–28), pp. 171, 172*).—Studies by MacDougal (E. S. R., 56, p. 516) having established the persistence of long-lived cells in certain cacti, the present work was inaugurated to investigate the more general question of longevity of cells in trees.

In the coast redwood (*Sequoia sempervirens*), two types of cells appear in recently matured secondary xylem: Wood parenchyma cells in vertical files scattered among the tracheids, and ray parenchyma cells, both living and densely filled with starch. The change from alburnum to duramen, readily recognizable in Sequoia by a brownish-red coloration of the duramen, is accompanied by a disappearance of starch and protoplasts from all wood parenchyma cells and the formation of an orange colored resin partially or wholly filling the lumen of the wood parenchyma. In some Sequoia individuals, a similar change occurs in the zone of transition from alburnum to duramen, in others only a disappearance of most of the starch, the protoplasts remaining intact and showing a thin layer of cytoplasm next the cell wall, a conspicuous nucleus, and a large central vacuole. Cells may remain in this condition for many years, and such ray parenchyma cells have been observed 70 annual layers deep in the heartwood. Since in such trees the sapwood constituted 21 to 28 layers, these cells were about a century old.

**Relation of living cells to upward movement of sap,** D. T. MacDougal, J. B. Overton, and G. M. Smith (*Carnegie Inst. Wash. Yearbook 27 (1927–28), pp. 170, 171*).—Extensive experimentation in California and in Arizona during four years furnishes no support for the hypothesis as to a direct action of living cells in causing upward movement of sap.

The external layer of living cells incasing the perennial stems seems to hold tightly the gases accumulating in the older nonliving portions, except as they may pass through in sap solution to the atmosphere. When subatmospheric pressures occur in the interior nonliving portions, gases may be liberated from solution in the sap. It appears that on the lowering of the interior pressures in branches and stems, air is drawn through the surrounding living layer deep into the stem, in which case gas movement through living cells may be notably accelerated by filtration pressures.

Many living cells in both rays and xylem parenchyma have common walls with nonliving elements which may be filled with gases or solutions. The exchange of gases between such contiguous elements would be determined by pressures, temperatures, and other factors affecting solubility. Variation of pH would vary permeability, liquids, and electrolytes passing into nonliving elements just as such substances pass from the soil, but such passage would not be large enough to affect notably movement of material in conducting tracts. Radial strips of living cells furnish a cell-to-cell waterway, though of comparatively small significance.

The results of this experimentation support the view of Strasburger that sap in a stem in which cells have been poison-killed follows a path identical with that in which it ascends in a living tree, except that the indicator dyes penetrate where the cells are killed. Beyond this, living cells in contact with the nonliving units may thrust tyloses into the lumina of the conducting tracts in such enormous numbers as to lessen materially the conducting capacity of the wood. This obstructive action of living cells on the ascent of sap is an effect vastly greater than any facilitation of movement which might result from their osmotic action.

**The liquid and gas-system in trees,** D. T. MacDougal, J. B. Overton, and G. M. Smith (*Carnegie Inst. Wash. Yearbook 27 (1927–28), p. 168*).—Experiments culminating within the year have shown that in tree trunks water and gases are localized according to definite patterns which are specific for the species concerned. The description of the distribution of these hydrostatic-pneumatic systems, as noted below, gives a picture of their physical relation to each other, but nothing as to the interactions of the two systems.

The hydrostatic system is, in effect, a series of concentric cylindrical columns extending from roots to leaves, laterally separated from one another by gas filled cylindrical columns of conducting elements. The water may be under a longitudinal stress of from 2 to 300 atmospheres measurable by manometers, though these can not, due to many interlocking factors, measure the degree of change (expansion or compression). Details are given for a study of live oak, also for the effect of an increase in pressure of the gaseous system upon the behavior of the hydrostatic system. It is regarded as clear that the varying pressures in the gas body exercise only a minor influence on the tension in the cohesive water system.

——— ——— **gases in the trunks of trees,** D. T. MacDougal, J. B. Overton, and G. M. Smith (*Carnegie Inst. Wash. Yearbook 27 (1927–28), pp. 174, 175*).—In continuation of studies on the nature of gases in tree trunks by MacDougal as previously noted (E. S. R., 57, p. 815), it has been demonstrated that the gas body within a tree trunk is continuous, and accordingly that pressure and suctions applied at given points are transmitted up or down for considerable distances. It was discovered also, as an apparently unrelated fact, that dyes pulled through the stem by the forces due to transpiration do not travel through all parts of a given annual ring, but in a definite portion only. During the previous summer, the authors have proved by several means that this zonation of the transpiration stream is due to the accumulation of gas in water-conducting elements situated in definite parts of each annual ring. Experiments are cited separately as proving this claim.

It is pointed out in conclusion that there is a seasonal variation in the extent of the gas body, and that stems (willow and walnut) which have a well-defined gas body in each annual ring during the summer may have the entire annual ring water filled at the approach of the growing season.

**The change in osmotic pressure of the plant juices in spring wheat under various conditions** [trans. title], V. V. Kvasnikov (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 6 (1929), No. 4, pp. 290–312*).—The juice for this experimentation was obtained from the entire plant with the aid of a hand press, several varieties of wheat grown in the greenhouse and in the field being used. The work covered two years and the results are summarized.

The osmotic pressure of the plant juices from hard and from soft wheats changes during the vegetative period. The absolute value of the osmotic pressure of plant juices from a pure line of Beloturka No. 1226 (not a drought resistant variety) fluctuated within the limits of 8.81 to 14.07 atmospheres, while that in Beloturka No. 1223 (a drought resistant variety) ranged from 7.16 to 14.75 atmospheres. The osmotic pressure of Beloturka grown in the field was lower than that from the same wheat grown in the greenhouse, though the moisture content was lower in the field. An increase of the osmotic pressure of the soil solution by 0.7 to 0.8 atmosphere, caused by adding sodium chloride, increased the osmotic pressure of the plant juices by 2 to 3 atmospheres. A decrease in the moisture content of the soil from 60 to 40 per cent of the total moisture holding capacity caused an increase of the osmotic pressure, more marked in the first stages of growth, with slight differences in the latter stage. In Beloturka No. 1226 the differences in osmotic pressure at 60 to 40 per cent of the total moisture holding capacity ranged from 20 to 28 per cent in the first half of the vegetative period and from 7 to 10 per cent in the second half. In Beloturka No. 1223 the differences were 35 to 80 per cent for the first half and 20 per cent for the second. At optimum moisture (60 per cent), No. 1226 showed a higher osmotic pressure than does No. 1223, but at 40 per cent the relationship was reversed. At a low moisture content No. 1223 gave the higher yield, but at optimum moisture content the yield of No. 1226 was higher. In the dry year 1927 the osmotic pressure of No. 1223, grown in the field, was higher than that of No. 1226. The reverse was true in the wet year 1928. In 1927 No. 1223 gave a higher yield than No. 1226, the reverse being true in 1928. Weather conditions (humidity, temperature, radiation) influenced the osmotic pressure, with the range of the change due to these conditions wider in No. 1223. Moist air, with a low temperature during the vegetative period under the conditions of insufficient soil moisture, gave the same osmotic pressure as in the case of a dry atmosphere and a high temperature with a sufficient supply of soil moisture. Transpiration was higher in the wheat which has a higher osmotic pressure at 60 per cent moisture.

**Radioactivity and plant propagation** [trans. title], A. V. and L. I. KOL'TSOVY (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *6* (*1929*), *No. 5–6, pp. 380–390*).—Following a review of related literature and an account of their own experimental work, the authors present their own views.

In radioactivity is found a potent factor operative in the fundamental processes which influence the growth and development of plants and several changes in their properties. The influence of radioactivity may be ascertained as exerted on seeds and plants in the state of rest, on germinating seeds, and on mature plants during the period of growth or fertilization. The influence of radium on the embryo can also be studied. In all these cases the influence of radium is more energetic on cells and tissues of later formation, the well-established tissues of a growing plant being very stable with respect to the action of radium.

The preparations for biological investigations include those used with the beta rays and partly with the gamma rays and those with the alpha rays. From knowledge concerning the nature and properties of the radioactive elements, it is suggested that in the case of the gamma rays, which represent a special form of radioactive energy, the electromagnetic frequencies which go into space are similar in a way to the action on life processes of the light rays of the sun's spectrum in the region of short waves having a high frequency. The beta rays, which represent a flow of negatively charged particles (electrons), may be looked upon as energy activators of potassium, which is from the standpoint of bioenergetics a constant source of negative charges in the cell, and in this case is looked upon as the carrier of the life energy of the cell. Only by accepting this supposition is it practicable to explain what seems at first a peculiar phenomenon, namely, the formation of two and even three times the amount of organic substance under the influence of radium. The alpha rays, which are material particles carrying positive electricity, and which represent charges of a high order which have hitherto served as an invaluable aid to physics and chemistry in the disintegration of the nitrogen and other atoms, may serve, like the beta rays, as vigorous stimuli in translocations, deficiency, and other hereditary changes of the genotype. These changes may control the formation and appearance of genovariations. The influence of radioactivity is modified by the time period of exposure, by the distance of the object from the radium preparation, as well as by the nature and properties of the radio-elements (the absorption of the rays by the layer of the radium salt). In the action of the radioactive elements on plants, there seems to be a latent period or one during which no clear-cut effect is noticeable, as it is only after a certain period that the stimulating property of radium appears effective. This period might be thought of in comparison with the incubation period of contagious diseases.

**Duration of the flowerless condition of some plants in response to unfavorable lengths of day,** W. W. Garner and H. A. Allard (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 5*, *pp. 439–443*, *figs. 3*).—In an attempt to ascertain how long herbaceous plants may be kept in a flowerless growing condition by regulating day length, *Sedum woodwardii*, *S. spectabile*, and *Cassia marilandica* plants were grown under controlled light conditions. The two sedums maintained a vigorous condition for several years without flowering, and while the Cassia plants were held under a 10-hour day for 9 years with no indication of flowering, growth was small, the plants sending up weak slender stems, which remained in a half dormant condition throughout the summer. In this species, continuous short days not only prevented flowering but led to conditions of dormancy and senility before sufficient reserves were accumulated.

## GENETICS

**Investigations in the genus Crepis,** E. B. Babcock (*Carnegie Inst. Wash. Yearbook 27* (*1927–28*), *pp. 352, 353*).—It is stated that the principal objective of these investigations is a clearer understanding of the evolutionary processes at work in the group Crepis, consisting of about 200 related species, a number of which have been made the object of studies previously noted (E. S. R., 46, p. 721; 47, p. 629; 48, p. 526; 53, p. 425; 55, p. 632; 61, p. 326; 62, p. 723). During the year here reported the work was conducted along four main lines, taxonomic studies, work on the chromosomes of species in relation to their classification, genetic and cytologic study of interspecific hybrids, and the investigations of chromosomal variations. This work and its results are outlined.

**Cytological and embryological studies on the genus Mentha,** M. L. Ruttle (Mrs. Nebel) (*Gartenbauwissenschaft*, *4* (*1931*), *No. 5*, *pp. 428–468*, *figs. 63*; *Ger. abs.*, *pp. 466*, *467*).—A preliminary report is presented upon studies conducted in part at the New York State Experiment Station. The haploid chromosome numbers found in several forms of Mentha were as follows: *M. requienii* 9, *M. pulegium* 10 and 20 (± 1?), *M. arvensis* 36 (± 1?), *M. aquatica* 48 (± 1?), *M. longifolia* 12, *M. rotundifolia* 12, and *M. niliaca* 12. In the various forms studied there was noted a positive correlation between chromosome number and cell size and between chromosome number and seed size.

**The genetics of the genus Phlox,** J. P. Kelly (*Pennsylvania Sta. Bul. 266* (*1931*), *p. 17*).—Several new patterns were found in the flowers of *P. drummondii*, the seed of which was obtained from Europe. One form, "picta," with radial white bands in colored flowers, proved recessive in the $F_1$ generation, and another, "halo eye," came through partly.

**A study of certain characters in wheat back crosses,** V. H. Florell (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 6*, *pp. 475–498*, *figs. 8*).—Little Club and

Jenkin club wheats were crossed with Quality, Hard Federation, and Marquis, all high quality common wheats, to improve the milling qualities of the club wheats, and the $F_1$ hybrids were back-crossed to facilitate selection of quality factors and club types. The material was used by the California Experiment Station cooperating with the U. S. Department of Agriculture to study inheritance of characters in the $F_1$ of the buck-crossed generation and also in the ordinary $F_2$ and $F_3$ generations. The $F_1$ of the crosses was club in type and was termed "long club."

The ratio of about one dense to one lax plant was obtained in all back-crosses with the lax parent, except in the (Jenkin × Marquis) × Marquis, where nearly all dwarf plants failed to head. A one-factor difference was suggested for club type and lax type of spike. Although true-breeding club lines of varying density were recovered in $F_3$, no true breeding long club like Jenkin appeared. While lax plants bred true, most of the extremely long lax forms reverted to the approximate internode density of the lax parents. The variations in density in pure-breeding $F_3$ material indicated the presence of modifying factors for both club and lax characters.

Dwarfs occurred in the back-crosses (Quality × Jenkin) × Quality and (Jenkin × Marquis) × Marquis in ratios of about 7 normal to 1 dwarf and in the $F_2$ of Quality × Jenkin and Jenkin × Marquis about 55 normal to 9 dwarfs. A three-factor difference between normal and dwarf was indicated. Jenkin was assumed to have the constitution $NND_1D_1D_2D_2$ and Quality and Marquis $nnd_1d_1d_2d_2$. Most dwarf plants had lax spikes, while club dwarfs usually had intermediate club spikes, and dense club-spike dwarfs rarely occurred. Possible linkage was indicated between the club factor and one of the dwarfing factors.

The ratio of brown to white glumed plants in the (Jenkin × Marquis) × Marquis back-cross was about 1 : 1 and in the $F_2$ of Jenkin × Marquis 3 : 1. A one-factor difference for glume color was indicated. Three or more factors probably were responsible for the difference in earliness observed between Quality and Jenkin and Quality and Little Club.

**[Genetic studies with swine at the Idaho Station]** (*Idaho Sta. Bul. 179 (1931), p. 20*).—In a study of cryptorchidism in swine this defect was found to be inherited. In a number of cases individuals having one testicle retained in the body cavity with removal of the other have failed to develop further evidence of masculinity and have shown typical physical characteristics with a total loss of sex interest. Histological studies of the retained gonad have shown that development was arrested in the sex and interstitial cell tissue.

A defect characterized by dwarfed or absent ears in pigs was quite common in one strain of Duroc Jerseys. It was possible to trace this to the earless dam of a famous show boar. Affected specimens revealed a number of structural skull defects.

Whorls and spotting in the hair of Duroc Jerseys were also inherited. Two factors, both of which must be present either in the homozygous or heterozygous form, were found responsible for whorls.

**Bibliography on the genetics and sex physiology of the rabbit** (*Edinburgh: Imp. Bur. Anim. Genet., 1931, pp. [1]+34*).—A bibliography of 378 references on breeding, genetics, and the physiology of reproduction in the rabbit.

**Conceptions in right and left horn of uterus** (*Idaho Sta. Bul. 179 (1931), p. 25*).—Studies of 146 pregnancies in dairy cattle showed that 64 per cent were located in the right horn of the uterus and 36 in the left horn. Thus, 75 per cent more conceptions resulted from the functioning of the right ovary than from the left. There was no preponderance of either sex in either horn.

## FIELD CROPS

**[Agronomic experiments in Idaho in 1930]** (*Idaho Sta. Bul. 179 (1931), pp. 17–19, 38–40, 41, 43–45*).—Field crops work at the station and substations (E. S. R., 63, p. 523) again reviewed comprised breeding work with wheat, oats, barley, alfalfa, sweetclover, red clover, and Ladino clover; variety trials with wheat, oats, barley, alfalfa, field peas, soybeans, and grasses; cultural (including planting) tests with wheat, peas (E. S. R., 66, p. 30), alfalfa, and potatoes; seed treatments with field peas and potatoes; irrigation tests with alfalfa, red clover, and potatoes; crop rotations; pasture studies; and weed control experiments.

**[Field crops investigations in Illinois]** (*Illinois Sta. Rpt. 1931, pp. 48–64, 65–68, 70–77, 179, 180, 259, 260, figs. 8*).—Research with field crops is reported on again (E. S. R., 64, p. 823).

After the thirty-fourth year of selection of corn for chemical composition, continued by C. M. Woodworth and W. J. Mumm, the high protein strain averaged 20.24 per cent of protein and the low protein 7.8, and the high oil 12.1 per cent of oil and the low oil 1.28. The differences were the widest ever obtained. The limit probably had been reached in the low oil strain, since germination was usually very poor due to the small germs. Selection for low protein was relatively ineffective.

That extremely early varieties of corn do not yield as high in Illinois as adapted sorts with growing periods filling the normal frost-free season was brought out by G. H. Dungan and W. L. Burlison. These workers and B. Koehler established that for best results seed corn should not be picked until mature, or at least fully dented. However, it should be gathered and placed in a suitable drying room before endangered by killing frosts. For full season varieties the best time for picking seed corn at the station was about October 12 to 15.

Corn, Dungan established, ought to be planted not later than May 10 in Illinois for best yield and quality of grain. Corn planted late because of corn borer or other reasons can be hurried to maturity through good soil treatment, according to results of F. C. Bauer and others. Koehler recorded losses from ear rots averaging 7.5 per cent of the crop in studies at the station, 1924–1930, inclusive. His work indicated that early-planted corn averages less ear-rot loss than late-planted corn; that open-pollinated strains carefully selected over a period for utility type suffer less from ear rot than average unselected seed; and that the corn strain used should be selected for ripening in an average season. Seed treatments by Koehler and J. R. Holbert of the U. S. Department of Agriculture did not benefit corn as much in tests in 1930 as in previous years, probably due to the unusual drought.

Studying the metabolism of diseased and healthy corn as related to soil fertility and fertilizers, E. E. DeTurk, E. B. Earley, and Holbert noted that a strain responding poorest to phosphorus took more phosphorus in growth and used more in the organic forms in its vegetative parts, even at the reproductive stage when a superior strain was sending more phosphorus into the developing ear. Cornstalk residues produced for D. C. Wimer only slightly higher yields of corn and wheat than did cornstalk ash. Most cornstalks may have to be burned to control the corn borer when it reaches Illinois.

Corn is damaged worse by hail, Dungan observed, when it comes between tasseling and the fresh-silk stage. The reduction in yields varies with the stage of plant development when blades are removed, and is roughly in proportion to the percentage of leaf area removed. Results from this study promise to aid in determining more accurately losses from hailstorms.

More evidence that Illinois farmers lose heavily because the grade of their corn is declining and therefore is discounted on the market, was obtained by L. F. Rickey. The percentage of cars grading No. 3 or better for the entire United States since 1917 rose from 53.7 to 57.1 per cent, while at Illinois inspection points corn grading No. 3 or better decreased from 48.8 to 40.1 per cent.

No significant differences in yield for any particular variety of wheat or of barley were found by Woodworth and O. T. Bonnett in seedings at different rates, nor did any one variety have all the desirable characteristics to the highest degree. Selection for hard- and soft-kerneled strains of Purkof wheat was not effective. Among $F_3$ families of Spartan × Wisconsin Pedigree barley, segregation was close to a ratio of 3 rough-awned to 1 smooth-awned plant, and in families heterozygous for head type, in the ratio of 3 2-row plants to 1 6-row.

Northern-grown seed potatoes yielded nearly 50 per cent more than home-grown seed stored at the same temperature in tests during 5 years by J. J. Pieper and W. P. Flint. Storage at 36° F. was best for both types, although northern-grown seed tended to yield better after higher temperatures and home-grown seed after lower temperatures. Use of Bordeaux in addition to calcium arsenate increased acre yields nearly 15 bu. On early potatoes in Cook County, J. W. Lloyd, E. P. Lewis, and C. C. Compton found that Bordeaux increased the No. 1 tubers 27 per cent and total yield 56 per cent, and copper dust 18 and 30 per cent, respectively. In the late crop, spraying increased yield 102 per cent and dusting 30 per cent.

Chlorates offered a promising means of easily and cheaply eradicating noxious weeds before they spread to the entire farm, although cultural methods still appeared cheapest for large areas. Pieper obtained best results with Canada thistle but only fair success with wild garlic, quack grass, and horse nettle. Fall applications were best, October seeming slightly better for wild garlic and quack grass. Spring and fall applications gave good results with Canada thistle. Very early and very late repeated applications with smaller quantities of chlorate seemed better than more applied once. Reproduction of wild garlic and wild onion is commented on, and loss from weeds and the spread of new weeds are indicated.

Artichoke, safflower, and hemp were tested by Burlison, Pieper, C. A. Van Doren, and Woodworth for Illinois as new crops with new uses. Variety tests for the year and periods in different localities in Illinois with corn, wheat, oats, and barley are again reviewed by Dungan and Burlison. Corn improvement work reported on by Woodworth and Mumm dealt with production of improved types, inheritance of factors, and exposure of several genetic types to X-rays. Woodworth and Bonnett review breeding work with wheat and barley, recording data on the development of barley varieties at different dates and on natural crossing in wheat. Genetic analysis of oats varieties by Woodworth and R. E. Fore indicated that yield and other desirable qualities may be the result of different factors in different varieties.

A study by Rickey and C. L. Stewart of the quality of farm seeds showed that in more than 9,000 samples analyzed 12.4 per cent were unsalable and 28 per cent required a statement on their tag because of noxious weed seeds.

**Methods of crop production at the Colby (Kans.) Branch Experiment Station, 1915 to 1929,** J. B. Kuska (*U. S. Dept. Agr. Circ. 184* (*1931*), *pp. 24, figs. 4*).—Field experiments and crop rotation and cultural methods (E. S. R., 64, p. 826) conducted in cooperation with the Kansas Experiment Station on Colby silt loam, typical of northwestern Kansas, are reported on, with notes on the soil and climatic conditions.

Winter wheat yields on fallow averaged about twice as much as on plats prepared otherwise, except after rye green manure, corn in 80-in. rows and beans in 40-in. rows, each of which partake in measure of the nature of a fallow.

The best method of fallow tried was plowing in May, before vegetation had grown enough to reduce materially the water content of the soil, and cultivating enough to keep the ground clean during the rest of the season. Fall plowing with the ground left rough over winter gave almost as good average yields, although exposing the soil to the danger of blowing. Delaying spring plowing for fallow until late June without previous cultivation resulted in a decrease of 6 bu. in yield. Plowing wheat stubble for fallow as soon as practicable after harvest and intensive cultivation during the entire fallow period, with or without a second plowing in June, resulted in a decrease of about 2 bu. of wheat. Listing practically equaled plowing under comparable conditions as a method of handling fallow. Since the catching and holding of snow and protection of the soil from blowing are important considerations, methods of fallow leaving the ground in stubble, rough, or in ridges over winter are preferable to those leaving it bare and smooth.

Other methods of preparation for winter wheat did not differ much as to results. Listing barley stubble gave somewhat higher yields than plowing, because volunteer barley was controlled better. Such methods as stubbling in, seemingly very poor, ranked with the others because of their efficiency in catching and holding snow and in protecting the wheat during winter and spring. Manure plowed under and and manure and straw as top-dressing on winter wheat apparently did not influence yields.

The low yields of spring wheat indicated that it is not adapted to the region. On fallow its yield was less than half that of winter wheat. No great difference was noted in the yields of oats on fall or spring plowing and drilling in corn stubble, but on summer fallow yields were 45 per cent larger than the best yield after another crop. Barley yielded much more than oats and responded well to fallow. Its yields differed little on land prepared in other ways. Listed corn outyielded plowed and surface-planted corn and was less likely to suffer total failure. Spring disking before listing increased the acre yield 1 bu. Corn listed in alternate rows averaged only 55 per cent as much grain as in ordinary 40-in. rows.

Milo surface planted averaged a little better than listed milo. Yields of milo on fallow more than doubled those on the best plats cropped continuously, while yields after green manure were appreciably lower than on fallow. Kafir yields on fallow nearly doubled those on land cropped the year before. Yields on spring and on fall plowed land differed little. Kafir seldom matured before frost, whereas the grain of feterita usually ripened fully. Corn made higher yields of grain than milo under every method tested. Where comparable, milo averaged from about 1 to 6 bu. more grain than kafir and 3 bu. more than feterita. Stover yields were in the average ratios—kafir 100, milo 64, and corn 42.

**[Field crops experiments at the Porto Rico Insular Station]**, R. Fernández García, P. Richardson Kuntz, F. Chardon, P. Osuna, P. González Ríos, I. A. Colón, and L. R. Serrano (*Porto Rico Commr. Agr. and Labor Rpt. 1929, Eng. ed., pp. 694–697, 701–704, 705; Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1930, Eng. ed., pp. 21–28, 29, 30, 31, 34, 35, 36, 45–60, 67–73, 78–92, 137–140, 141, 142, 144, pl. 1, figs. 7; also in Porto Rico Commr. Agr. and Labor Rpt. 1930, Spanish ed., pp. 161–171, 174, 179, 180, fig. 1*).—Agronomic studies (E. S. R., 62, p. 129) reported on from the station and the Isabela Substation for the years ended June 30, 1929 and 1930, comprised variety, strain, and seedling trials and germination (fuzz), cultural, fertilizer, and liming tests with sugarcane; breeding work with sugarcane and tobacco; fertilizer, irrigation, and spacing tests with cotton; variety tests with tobacco, sweetpotatoes, potatoes, yautias, dasheens, and miscellaneous grasses and legumes; and a production test with Peruvian alfalfa. The yields, field germination and arrowing, monthly growth and mosaic infection, and analyses of juice of sugarcane varieties are tabulated and discussed.

**[Legume research in Illinois]** (*Illinois Sta. Rpt. 1931, pp. 40–48, figs. 2*).—Further experiments with legumes (E. S. R., 64, p. 829) are reported on.

The best grass-hay mixture found by J. J. Pieper was alsike clover and red clover in combination with timothy, the best hay grass. Cut twice per year, alfalfa with timothy outyielded alfalfa alone and reduced markedly the loss from alfalfa wilt disease. Field peas or winter vetch with oats made the best early emergency forage and Sudan grass, alone or with soybeans, the best late one.

Sweetclover was more effective for increasing crop yields on many soils when fertilizers containing potassium are used, according to O. H. Sears and L. E. Allison. When available potassium is lacking, accumulation of nitrate nitrogen may unbalance the crop's food supply, which condition may be corrected through the use of potash salts. The potassium also may limit the quantity of protein synthesized in the plant tissues. Some unfavorable results reported from using potash might be avoided by using available nitrogen.

In five soybean varieties drilled at the same rate, stands in 1-ft. sections of rows chosen at random by C. M. Woodworth differed widely for different varieties due to size of seed, especially with those having the smaller seed. With increase in plants per section total yields of each section rose and yields per plant decreased. In 26 varieties nodes per plant ranged from 19 to 44, pods per node 0.84 to 1.5, seeds per pod 2 to 2.77, abortive seed 14.94 to 31.6 per cent, each 100 seeds 4.94 to 18.21 gm. in weight, and seeds per plant 3.5 to 10.22 gm. Inheritance of hard seed coat was found complex.

Soybean varieties remaining outdoors all winter varied widely in resistance to unfavorable conditions. Nearly all pods of Peking shattered, and other varieties showed considerable shattering and a cracking of the outer pod coat which exposed the thin membranous inner coat and let in rain water, with subsequent spoilage. Pods of a selection from Morse remained unshattered and intact with the seeds in good condition.

Soybean varieties were tested in various localities under different systems of farming by W. L. Burlison, J. C. Hackleman, and C. A. Van Doren. Their seeding tests again indicated as best 60 lbs. per acre in 24-in. rows, and May 20 as the planting date. In comparative tests of five varieties of five crops the 1926 seed yielded most, 23.4 bu. per acre, 1929 seed 22.4, 1928 seed 21.5, 1927 seed 21.4, and 1925 seed 15.2 bu. The 1925 seed of Manchu showed the greatest loss of vitality.

Where the entire soybean crop is removed, Sears found that the value of inoculation does not carry over to the following crop, provided it is not also soybeans. Where part of the crop is returned to the soil as manure or soybean straw, inoculation benefits will be proportional to the increase in the soybean yield due to inoculation.

Nodule bacteria were observed by Sears and M. F. Hershberger to die rapidly after put on soybean seeds; best results may be expected when the crop is planted soon after inoculation. Some of the organisms, although not many, survived on the seeds for weeks after inoculation. When about 0.5 pt. of liquid is applied per bushel of seed, inoculation can be made to advantage as the seeds are sown. Otherwise just enough seed for one-half day's planting should be treated.

For nodulation, Sears and Hershberger determined that cultures must be used under favorable conditions and contain a large number of effective organisms. Nodulation may be better the second time the crop inoculated is grown on the land. Legume inoculants should be selected primarily on ability to produce nodules and to increase yield and quality rather than for ease of application. Cultures of the dry type tested thus far were not so good as those prepared for use with water.

Red clover may give better stands when sown on winter grain early, according to Pieper, W. P. Flint, and J. H. Bigger. Of the spring grains barley was the best nurse crop for red clover. Fall clipping has increased the yield of hay and seed, while spring clipping decreased the seed yield. The first crop of red clover made the most seed. Foreign red clover seed did not equal the best Illinois strains.

**Hard seeds in legumes: Interpretation of their value and methods of treatment, W. O. Whitcomb** (*Montana Sta. Bul. 248 (1931), pp. 63, figs. 9*).—Prolonged studies of the behavior and treatment of hard seeds in small-seeded legumes included extensive laboratory, greenhouse, and field experiments. The work of others on the same problem was considered at length, the review embracing 67 titles.

Great variation was observed in the occurrence and behavior of hard seeds in alfalfa, alsike, red, and white clovers, and sweetclover, and also in different lots of the same kind of seed. Well-ripened seeds seemed to have a higher hard-seed content and also higher germination than more immature seeds. The resistance of hard seeds to germination or decay was shown by the hard seeds remaining viable in the field soil at the end of the growing season—for alfalfa 1.1 per cent, sweetclover 74, and for red clover 61 per cent. Hard seeds remaining in greenhouse soil for 1 year still could germinate from 85 to 98 per cent.

Scarifying, treatment with sulfuric acid, or application of heat each increased germination and decreased the hard-seed content in laboratory tests, although such treatments tended to lower the vitality of the seeds and their production of plants under field conditions. Tests on seed variously scarified indicated that after the slightest injury to the seed coat no seed remains hard, while injury to the embryo renders germination uncertain. Sulfuric acid was the only one of a number of fat solvents and other reagents which markedly increased permeability. The ether extract of unground seed for 16 hours amounted to 0.11 per cent for alfalfa and sweetclover seed and 0.17 for red clover seed. With dry heat, 75° C. for from 3 to 6.5 hours gave best results for alfalfa. Sweetclover was more resistant to heat than alfalfa but less so than red clover. The heating method seemed applicable only to small quantities of seed.

Field trials indicated that legume seed containing appreciable quantities of hard seed seldom is benefited by scarifying or treatment with sulfuric acid, except sweetclover in the hull or when containing more than 50 per cent of hard seed. Sweetclover seeds which are hard may remain in the soil for 2 years or longer and may be caused to germinate by plowing, and thus to contaminate the following crop.

The current knowledge of the behavior of hard seeds under varying conditions is believed to warrant the continuation of the recommendations of the Association of Official Seed Analysts of North America that all hard seeds be reported separately from germination by seed laboratories, but that seed dealers be permitted to add the hard seed to the germination, provided the hard seeds are also stated separately.

**The correlation between stand and yield of alfalfa and sweetclover,** C. J. WILLARD (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 5, pp. 461–464*).—Examination of data from numerous square yard samples drawn from broadcasted forage plats by the Ohio Experiment Station revealed correlations for alfalfa and sweetclover, respectively, between yield of tops and stand 0.28 and 0.29; yield of roots and stand 0.55 and 0.45; and yields of tops and of roots 0.36 and 0.59. The regression of yield on stand was 0.29 and 0.23 per cent for yield of tops and 0.45 and 0.36 for yield of roots, respectively, for each 1 per cent of change in stand. The probable error of a single square yard sample for alfalfa and sweetclover, respectively, was ±13.6 and ±14 per cent of the yield of the tops and ±10.9 and ±14.2 per cent of the yield of the roots. The significance of these results is commented on briefly.

**Tame pastures in Kansas,** A. E. ALDOUS and J. W. ZAHNLEY (*Kansas Sta. Bul. 253* (*1931*), *pp. 39, figs. 11*).—Practices, based on experiments at the station and experience, are outlined for the establishment and management of tame pastures in the State, and the adaptation and cultural needs of a number of perennial grasses, several legumes, and pasture mixtures are described briefly. Directions also are given for growing Sudan grass, rye, and wheat, and rape for temporary pastures and for the control of weeds and brush (E. S. R., 64, p. 827).

**Sisal and henequen, plants yielding fiber for binder twine,** L. H. DEWEY (*U. S. Dept. Agr. Circ. 186* (*1931*), *pp. 12, figs. 6*).—The characteristics, origin and distribution, adaptation, cultural and harvesting requirements, preparation and utilization as fiber crops, and textile uses are described for sisal (*Agave sisalana*) and henequen (*A. fourcroydes*). Both species are cultivated on large plantations in the Tropics, and the fibers are cleaned by the same types of machines and are used in the manufacture of binder twine and other hard fiber twines and ropes of small diameter. Henequen is used more than any other fiber as binder twine for harvesting grain.

**Pop corn,** A. M. BRUNSON and C. W. BOWER (*U. S. Dept. Agr., Farmers' Bul. 1679* (*1931*), *pp. II+18, figs. 13*).—Superseding Farmers' Bulletins 553, Pop Corn for the Home, and 554, Pop Corn for the Market (E. S. R., 29, p. 743), this publication, prepared in cooperation with the Kansas Experiment Station, discusses popping and other qualities of pop corn, varieties of pop corn, seed selection, field and cultural methods, harvesting, storing, and marketing practices, and the control of insect pests and diseases.

**Time of planting as affecting yields of Rural New Yorker and Triumph potatoes in the Greeley, Colo., district,** W. C. EDMUNDSON (*U. S. Dept. Agr. Circ. 191* (*1931*), *pp. 7, figs. 2*).—Planting tests were made with potatoes for the late crop in the period 1925 to 1929, inclusive, at the Colorado Potato Experiment Station with plantings about May 20, June 2, and June 12. Results with Rural New Yorker indicated that early plantings tend to surpass those made as late as June 12, both as to yield and maturity. The yields of Triumph, except for the last planting in 1928, increased with the lateness of planting, those of June 12 producing much larger yields than the earlier plantings.

**The culinary qualities of white or Irish potatoes,** J. S. COBB (*Pennsylvania Sta. Bul. 266* (*1931*), *p. 14*).—Indications were that healthy seed of any strain of potatoes will give good cooking qualities under good growing conditions but that under like conditions some strains excel others. Flavor possibly may be omitted from the score sheet, since a marked correlation was found between texture and flavor, and texture is determined easily. A soggy or waxy tuber will have poor flavor, while a mealy potato usually has good flavor. In 1930 Green Mountain led in the production of tubers of high quality, and thus far the highest quality tubers have come from Somerset County.

**The assimilation of nitrogen by tobacco,** A. B. Beaumont, G. J. Larsinos, P. Piekenbrock, and P. R. Nelson (*Jour. Agr. Research [U. S.] 43 (1931), No 6, pp. 559–567, figs. 4*).—A detailed account of studies at the Massachusetts Experiment Station of the assimilability of nitrogen carriers by Havana tobacco, leading to conclusions essentially noted earlier (E. S. R., 63, p. 523).

**The relation of air conditions to tobacco curing,** J. Johnson and W. B. Ogden (*Wisconsin Sta. Research Bul. 110 (1931), pp. 48, pls. 8, figs. 12*).—The influence of various temperature and humidity conditions on the rate of curing of tobacco and the quality of the product was determined in cooperation with the U. S. D. A. Division of Tobacco and Plant Nutrition.

The optimum temperature for curing was found to lie between 90 and 95° F., provided that a high enough humidity was maintained. The ordinary range of constant temperatures permitting approximately normal curing, assuming favorable humidities, however, lies between 65 and 100°. The optimum relative humidity for curing depends upon the temperature. In general, between 75 and 100°, a percentage relative humidity corresponding to the temperature figure is considered about satisfactory, that is, at 75°, 80°, etc., the relative humidity should preferably be about 75 per cent, 80 per cent, etc., respectively. Relative humidity did not measure the air-moisture relations surrounding curing tobacco as satisfactorily as the evaporating power of the air as measured by Livingston atmometers. On the latter basis evaporation of from 8 to 12 cc. per day seemed most desirable for all temperatures.

In the curing sheds, over six seasons, the average daily temperatures for weekly periods rarely exceeded 75°, even at the top of the shed, indicating that ideal curing conditions are approached rarely and then only for short periods. The average daily relative humidity for weekly periods varied from 44 to 96 per cent, while the average daily evaporating power of the air varied from about 3 to 21 cc. There were significant differences in temperature and humidity between the upper and lower tiers of the curing shed. The practicability of the application of artificial heat to air curing by means of a hot air furnace system in the curing shed, according to a preliminary report, will depend upon a number of factors yet to be determined.

The nature and prevention of pole rot and other forms of damage in curing are described briefly. Dusting green leaves with organic mercury dusts resulted in normal curing, with fairly good color and practically no decay, whereas undusted leaves in the test damaged badly with typical pole rot and finally decayed almost completely so far as leaf strength was concerned. The evidence from these studies pointed to the direct relation between a species of Alternaria and pole rot.

## HORTICULTURE

**[Horticultural investigations at the Idaho Station]** (*Idaho Sta. Bul. 179 (1931), pp. 12, 32, 33*).—In spray residue studies it was found that the removal of arsenic was facilitated by the addition of salt to the hydrochloric acid wash. The peak spray with oil and lead was satisfactory as far as removal was concerned.

Practical results secured from long time apple breeding studies include several promising seedlings from Ben Davis × Jonathan, Ben Davis × Esopus, Ben Davis × Wagener, Jonathan × Wagener, Jonathan × Esopus, and Rome × Wagener crosses. On the other hand, Ben Davis × Rome, Jonathan × Yellow Newtown, and Rome × Yellow Newtown crosses produced no desirable progeny.

Prune investigations in the Boise Valley showed an increase in sugar content and a decrease in acid during the picking season. Early-picked prunes canned immediately yielded a light colored product, but the same fruit when canned after a period of storage yielded a darker and more attractive material. There were evidently changes occurring in storage that promoted a better colored product. Fruit picked when containing 17.2 per cent sugar and 1.07 per cent acid had a decidedly different flavor than that containing 21.9 per cent sugar and 0.56 per cent acid, but when sugar was added at canning to the first lot the flavor was practically equal. Prunes in old orchards ripened as much as 2 weeks earlier than in adjacent young orchards. Differences in sugar and acid content were apparently less marked than in firmness of fruit.

Firmness of sweet cherries as indicated by pressure tests was rather closely correlated with the tendency to crack. In Lambert cherries cracking increased rapidly as soon as the pressure resistance had fallen below 6 lbs., in Royal Ann there was a notable increase in cracking below 8 lbs., and in Bing below 9 lbs. Cracking increased in severity with an increase in sugar content. When cherries lost their normal turgor there was a marked decrease in the amount of cracking.

**[Horticulture at the Pennsylvania Station]** (*Pennsylvania Sta. Bul. 266 (1931), pp. 26–29, fig. 1*).—Under the abnormally dry conditions of 1930, soils in which the organic matter content had been built up sufficiently or maintained by cover crops were found by R. D. Anthony and F. N. Fagan to retain sufficient moisture to grow new cover crops and to develop satisfactory crops of fruit. Closely underlying ledges were highly detrimental. Nitrogen and phosphorus promoted better cover crops and also fruit crops than did nitrogen alone. Early seeding of cover crops, in late May or early June, increased the amount of organic matter over later plantings and caused no injury to bearing apple or peach trees. Heavy bluegrass sods were found to monopolize the nitrogen applied to the soil to the detriment of the fruit trees. Breaking the sod resulted in a marked recovery of the trees and an excellent cover crop growth.

As reported by Fagan, there was no essential difference either in height or girth in 4-year-old Northern Spy apple trees whether disbudded at planting or pruned in the usual manner, the number of scaffold limbs being the same in both cases.

Certain promising varieties and strains of vegetables are reported by W. B. Mack and G. J. Stout. Strains of the Marglobe tomato varied considerably in yield.

Cabbage and tomato breeding conducted by C. E. Myers consisted primarily in tests of improved strains developed by the station. In both the Early Jersey Wakefield and the Danish Ballhead types of cabbage station selections were superior in yield, type, and unformity to commercial stocks. The popularity of the Penn State Ballhead cabbage was indicated in the fact that 2 tons of seed were used in the preceding 2 years. The Penn State Earliana tomato greatly outyielded commercial strains of the same variety. Marglobe outyielded Matchum by 54 per cent and Nittany by 23 per cent. When spaced equally no significant differences were found in the yield of third generation segregates of a tomato cross in which the parents had indeterminate and determinate foliage. It is believed that the determinate strains could have been planted more closely, with larger yields resulting. With respect to epidermis color, whether yellow or transparent, there was some indication that yellow types were earlier but no difference in respect to acre yields.

In work with lettuce M. T. Lewis succeeded in isolating a superior strain of the New York and of the White Boston varieties. In the progeny of a

Hanson × Mignonette combination, there was a ratio of three pigmented to one nonpigmented plant in the second generation.

**[Horticultural investigations at the Porto Rico Insular Station]**, R. FERNÁNDEZ GARCÍA, P. GONZÁLEZ RÍOS, T. BREGGER, F. CHARDON, P. OSUNA, and L. A. SERRANO (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1930, Eng. ed., pp. 31–33, 34, 35, 61–67, 73, 74, 142–144, pl. 1; also in Porto Rico Commr. Agr. and Labor Rpt. 1930, Spanish ed., pp. 173, 174–179, 180, fig. 1*).—A survey made of the native fruits of the islands revealed one promising seedless orange which is technically described and one or more promising avocados. Grapefruit trees when given wind protection developed satisfactorily. Work with truck crops is briefly noted, with the comment that tomatoes and peppers were profitably shipped to New York City. Varietal notes are presented on mangoes, papayas, strawberries, and other fruits. A total of over 57,000 plants of 44 species were distributed for trial, chief among these being the Chinese Dwarf lemon, jack fruit, mulberry, sweetpotato, and various other vegetables. A tabulated list is presented of new plant introductions. Sugarcane as an interplant for grapefruit served as an effective wind barrier.

**[Olericulture at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 252–259, 260–263, fig. 1*).—Experiments by J. W. Lloyd and E. P. Lewis in Cook County showed the desirability of a cover crop system in which rye and vetch follow onion sets, sweetclover follows sweet corn, rye follows cabbage, and oats cucumbers. In general, fertilizers low in phosphorus did not give profitable yields; in fact, on a soil low in phosphorus, nitrogen and potash are not economical unless the phosphorus ratio is high. Fertilizers high in phosphorus hastened maturity in sweet corn and cucumbers. Satisfactory yields were possible without stable manure if commercial fertilizers were combined with cover crops and crop residues. High grade complete mixtures proved the best combination as substitutes for manure. When used as a supplement for part of the manure phosphate gave the most economical results. In most cases the highest yields were obtained where some manure was used. Rock phosphate without manure yielded less than superphosphate in most cases. Nitrogen alone did not give good results generally, suggesting the need of ample phosphorus to make the nitrogen effective. Lime produced fine yields of tomatoes, peppers, and cauliflower in 1930.

In an asparagus plantation set in 1926 in which different methods of cutting were compared, yield and quality were greatly affected by the length of the preceding cutting period. It is advised that a field should not be cut longer than 2, 4, and 6 weeks, respectively, in the first, second, and third years after setting. Considerable progress was made in the selection of uniform shaped and colored Detroit Dark Red beets and also in improving cabbage and tomato varieties.

Eleven superior and prepotent inbred lines of Country Gentleman and four of Narrow Evergreen sweet corns were isolated by W. A. Huelsen and M. C. Gillis. Recombinations yielded 100 per cent more than the parent stock. Crossing the progeny of one year's cross each year following with the same inbred line did not decrease yields in the majority of cases, and uniformity of type and size were as good as in first generation hybrids. It is believed that following one more similar back-cross the new types can be maintained by simple selection.

Fertilizer experiments with sweet corn by Huelsen, Gillis, and W. H. Michaels continued to show that 100 lbs. per acre of 0–16–6 to 0–16–12 (N–P–K) gave the best returns when minerals were used alone. Yields were lowered in most cases where fertilizers containing nitrogen in various forms were applied at planting. The most profitable use of nitrogen was in the form of nitrate of soda applied as a side dressing at the rate of 50 lbs. per acre in addition to other fertilizer. It was evident that the side dressing would be desirable as a supplement to the 100-lb. application of 0–16–6 or 0–16–12. Hill dropping of fertilizer gave better results than broadcasting. Combined hill dropping and broadcasting gave the poorest returns. Hill dropping of fertilizers did not interfere with germination.

Huelsen, Gillis, and Michaels continued their work in breeding Fusarium wilt resistant tomatoes. In addition to Blair Forcing and Lloyd Forcing, a third greenhouse tomato known as No. 1001 was found promising. Several new Fusarium-resistant canning tomatoes were also developed. An early-maturing strain of the Century tomato was selected.

**[Pomological investigations at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 221–236, 238–241, 245–252, 263, figs. 9*).—As reported by J. C. Blair and J. C. Whitmire, up to the close of the 1930 season 608 seedling apples had been selected and propagated from among the station seedlings as potentially valuable varieties.

Hybrids between native and Japanese plums were found by R. L. McMunn to possess cold-resistant fruit buds under conditions that killed both Japanese and European varieties. Sapa, Opata, Underwood, Monitor, and Elliott were meritorious varieties.

A total of 12 apple varieties were under test by V. W. Kelley to determine their hardiness. Respiration rates were determined on twigs taken from the trees February 5 and 18, March 12, and April 6 and showed considerable differences in respiration, with little fluctuation in general in the ranking of the 12 varieties within the temperature range of 40 to 60° F. There was noted a tendency to correlation between respiration rate and the time of leaf bud opening in the spring.

Studies by W. A. Ruth and Kelley of methods of training young fruit trees were continued. Observations on old trees showed that unprofitable production is often the result of large wounds caused in removing poorly placed branches or in the loss of branches or splitting of the trunk. Starting the framework by disbudding the one-year-old trees is recommended as an easy way to avoid much of the difficulty in older trees.

As determined by M. J. Dorsey and R. S. Marsh, fruit trees heavily fertilized one year may be less abundantly fed the succeeding year if this is an off season. In a Calhoun County orchard nitrate of soda and sulfate of ammonia were equally effective on mature apple trees, but cyanamide did not give the growth or leaf color of the other materials. Ben Davis trees given 8 lbs. of nitrate of soda showed the benefit the second season.

Ruth reports a 1,000 per cent profit from applications of nitrate of soda to Grimes trees. At Olney sweetclover just becoming established had not affected yields. The stunted sweetclover crop of 1930 caused a dropping of the lower leaves of Jonathan trees, apparently by competing for water. In 1930 nitrogen increased the yields of Jonathan by about 50 per cent and those of Grimes were more than doubled. Nitrogen increased the average size of both varieties about 10 per cent. Muriate of potash in addition to nitrate of soda did not increase yields, and none of the fertilizers had a clear-cut effect on flower formation in 1930 and 1931. Trenching under the outer tips of the branches reduced shoot growth materially and prevented flower formation completely, except where nitrogen was used, in which case growth and flowering were normal. The trenches, 30 in. deep, were opened in 1927 and reopened in 1929 and 1930. Pruning of lower branches to allow the sun to reach the soil below the tree did not reduce shoot growth in 1930 nor affect flower bud formation. Cultivation during July over a period of years to destroy surface roots did not affect the trees. The severe drought demonstrated the value of nitrogen and of allowing the root system to extend beyond the tips of the tree in unfertilized soil. Detailed annual pruning of apples was found by Ruth and Kelley to have little effect on yield or the habit of bearing biennially but did enhance color and facilitate spraying in mature Grimes and Jonathan trees. As reported by Kelley, initial bearing was delayed and size of tree and of crop reduced when young trees were pruned moderately to heavy. In three of four heavily pruned plats severe trunk injury appeared in 1930 following abnormally low winter temperatures. Of 170 trees 90 were damaged to the extent of probable death, while none of 225 moderately and 210 unpruned trees were visibly injured. Wealthy seemed more susceptible than Duchess. It is believed that the injury was due to the cumulative effects of 6 years of pruning.

A flotation sulfur is recommended by H. W. Anderson as a substitute for lime sulfur where apples are injured by the latter. Where scab control is difficult or where the variety is not very susceptible to lime sulfur injury, lime sulfur should be used in the prebloom sprays. Other types of wettable sulfur made from ground sulfur did not give satisfactory scab control. In the apple spraying experiment carried on at Neoga, lime sulfur, flotation sulfur, and calcium monosulfide were compared. Flotation sulfur of the two types used gave equally good control of scab and blotch, and when used throughout the season gave as good control as did lime sulfur. The monosulfide was not equal to the other sulfur materials. Much less foliage injury was caused by flotation sulfur than by lime sulfur.

As determined by Kelley and M. D. Farrar, high concentrations of oil markedly retarded the opening of leaf buds. Tests on excised twigs 2 weeks after fall and winter oil sprays were applied indicated that a 2 per cent application of an unsaturated oil of 85 viscosity, applied on December 2, did not break the rest period of the leaf buds. Other twigs taken 6 weeks after spraying showed retardation of bud opening, the difference becoming evident 1 month after the twigs were cut. Twigs taken February 4 from trees sprayed January 31 showed retardation, while a sample taken at the same time from a block sprayed December 2 showed little or no retardation. Neither the December 2 or January 31 oil sprays caused any noticeable effect on actual opening of buds in the orchard. This was also true in the case of saturated oils. A 2 per cent dormant and delayed dormant application of oil applied March 23 and April 18, respectively, slightly delayed leaf bud opening, and a 3 per cent concentration unsaturated homemade emulsion applied March 23 also delayed opening. An 8 per cent oil applied at the same time markedly delayed all varieties. Many of the lateral buds apparently failed to open. As late as April 28 retardation was still evident in the 8 per cent block. Two 2 per cent summer applications of emulsions made from light and medium heavy oils, both saturated and unsaturated, caused no perceptible injury, despite high temperatures prevailing. A 2 per cent application of saturated oil of 83 viscosity on June 13 apparently accentuated a condition which caused the yellowing and dropping of leaves believed primarily due to drought.

The Douglas pear, of fair quality and of marked resistance to fire blight, is deemed by Anderson to be of considerable promise. Fire blight caused serious loss to Yellow Transparent apple growers in southern Illinois. Many varieties and species of pears were studied in search of resistant types. Seedlings bred for resistance too closely resembled the inferior wild *Pyrus ussuriensis* parent.

Some success in blight control was obtained by growers who sprayed apples in full bloom with Bordeaux mixture, but the process is deemed hazardous.

Dorsey and Ruth, working at Olney, found that an annual cover, such as cowpeas, is more dependable than sweetclover for adding humus to the soil. As determined by Dorsey and McMunn, there was no advantage gained in splitting the application of fertilizer. Measurements of trunk, yield, bud formation, bud hardiness, and foliage color showed little or no difference between the heavier applications, regardless of whether applied at one time or in split amounts.

Light pruning of sour cherries was found by McMunn to cause no appreciable reduction in yield and to aid in uniform ripening and efficient spraying. Heavy pruning did reduce yields. Pruning with or without fertilization failed to increase the size of cherries.

Variety tests of small fruits conducted by A. S. Colby revealed several satisfactory varieties. No difficulty was found by Colby in working over vigorous, healthy grapevines to the Kniffin system, which in studies was found better than the Fan, Chautauqua, and Munson. In the case of the Fan and the Chautauqua systems it became difficult in the course of time to find desirable fruiting canes when pruning. Seedling raspberries originated by Colby were found to differ strikingly in hardiness, vigor, disease resistance, and quality of the fruit. Very promising selfed seedlings were obtained from Cumberland, Plum Farmer, and others. Quillen was by far the best parent. Royal Purple seedlings were less fruitful and vigorous than the parent. Quillen (black) × Latham (red) yielded some promising purple seedlings. A search by Colby and Anderson for the causative organism of a strawberry root rot was unsuccessful, but it was evident that varieties with heavy root systems were better adapted for planting in infested soils, and that planting in fresh soil and the use of new stock from clean fields were desirable.

Results obtained by J. W. Lloyd and H. M. Newell in fruit transportation studies indicated that the shape and construction of the containers and the disposition of the load within the car materially affected the rate of air movement, which is deemed an important factor in the prompt cooling of fruit.

**Removing spray residue from apples and pears,** H. C. Diehl, J. M. Lutz, and A. L. Ryall (*U. S. Dept. Agr., Farmers' Bul. 1687 (1931), pp. II+32, figs. 9*).—Presenting a general discussion of the spray residue situation as regards the removal of arsenic from apples and pears, the authors discuss various types of washing equipment, with suggestions for the manufacture of homemade outfits, etc.

**The fertilization of red raspberries,** A. E. Stene (*Rhode Island Sta. Bul. 229 (1931), pp. 21, figs. 2*).—The importance of potassium in the fertilization of red raspberries on the soil concerned was indicated in average plat yields of 35,506, 42,327, 51,067, and 24,110 gm., respectively, for minus nitrogen, minus $P_2O_5$, complete fertilizer, and minus $K_2O$ treatments. Four varieties, Latham, June, Herbert, and Cuthbert, were included, and the yields averaged over a 3-year period. As concerns varieties, Latham led in hardiness, yield, and resistance to mosaic disease. June was second in hardiness and mosaic resistance and third in yield. Cuthbert was third in hardiness, fourth in mosaic resistance, and second in yield. Herbert was fourth in hardiness and yield and third in mosaic resistance. Latham, Cuthbert, and Herbert ripened at approximately the same time, with June from 4 to 10 days earlier.

**Citrus culture in Porto Rico** [trans. title], H. C. Henricksen (*Porto Rico Sta. Bul. 33 (1931), Spanish ed., pp. 35, figs. 16*).—An English edition of this bulletin has been noted previously (E. S. R., 63, p. 141).

**Vegetative propagation of the black walnut, with special reference to the factors influencing callus formation and union in grafting,** B. G SITTON (*Michigan Sta. Tech. Bul. 119 (1931), pp. 45, figs. 21*).—Of various possible factors, temperature, relative humidity, chemical composition, and condition of the scion wood, that might play a part in the successful propagation of the black walnut, a species described as very difficult to increase asexually, favorable temperature was found highly important by its accelerating effect on wound parenchyma formation. A temperature range of from 24 to 30° C. was most favorable, with the optimum around 28° (82.4° F.). Relative humidities of 75 per cent or larger appeared to be satisfactory. The curve for callus formation agreed in general with growth curves, except that the rise was more abrupt.

No material or consistently favorable results were obtained through girdling or defoliating the shoots or from the use of nitrogen fertilizers, yet it was evident that the condition of the shoots used as scions was important. Poor results were obtained with defoliated shoots, and the best results were with shoots taken from well spaced trees bordering a cultivated field.

Anatomical studies indicated that the walnut is more sensitive to wounds than is the apple, and that protection of the wood from drying by the plugging of xylem tissues proceeds much more slowly. The most desirable scion wood was from 2 to 3 years old and of a diameter between ⅜ and ⅝ in. The percentage of scions forming callus was independent of the size of the pith and increased with the total width of the vascular tissues, from 2 to 5.6 mm.

Preliminary observations indicated that the patch bud method of propagation is desirable for the black walnut.

**[Floriculture at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 264–270, figs. 4*).—Finding that the flowering of gladiolus corms was greatly increased under artificial light, depending on variety, intensity of light, and the stage of development of the plants when first lighted, F. F. Weinard and S. W. Decker planted early-harvested, California-grown corms on October 19 under strong and weak artificial light applied from dusk to midnight. With normal light, strong light, and weak light, respectively, Souvenir corms bloomed 30, 112, and 96 per cent. Under the same conditions Virginia corms bloomed 50, 102, and 86 per cent. The earlier the light was applied in the development of the plant the more marked was the result.

As found by Weinard, Decker, and S. W. Hall, steaming greenhouse soils which had been in use for 1 to 12 years proved an effective means of rejuvenating such soil. Steaming new soil gave little or no increase in yield. Records taken on rose plants received from storage in March, April, May, and June and all set in the bench on July 1 after holding in pots showed the best results from the March and April plants, in survival, in number of blooms per plant, and in length of stems. Holding the plants in soil during the prebenching period was more satisfactory than in peat moss.

The study of a large collection of peonies was continued by H. B. Dorner and Weinard. Decker and Weinard found that superphosphate and nitrate of soda were the best sources of phosphorus and nitrogen for the peony. A combined treatment of superphosphate and nitrate of soda gave somewhat better results than any other treatment. A heavy mulch of strawy manure promoted a rank growth of weak stems at the expense of flowers. Cutting of flowers reduced the yield of the next crop in direct proportion to its severity. No cutting gave 20.4 flowers per plant, whereas when all flowers were cut and but three leaves left per stem there was an average of only 9.8 flowers.

As found by Weinard and Decker, the treatment of gladiolus corms with mercuric chloride or calomel before planting greatly improved the appearance, size, and number of corms in the crop harvested. Comparing no treatment, mercuric chloride, calomel, Semesan, and formaldehyde, the greatest number of corms were harvested from the calomel lot, but the largest weight of corms from the mercuric chloride.

**The propagation of flowers by cuttings and seeds,** W. W. Wiggin (*Ohio Sta. Bul. 487 (1931), pp. 37, figs. 7*).—The results are presented of a series of propagation trials with greenhouse and outdoor flowering plants. With cuttings it was found that for rooting a condition of medium vegetativeness was better than either extreme. Cuts made at random proved satisfactory with the majority of the plants tried, rooting generally taking place directly above the cut surface, irrespective of where the cut was made. Carnation cuttings yielded equally productive plants regardless of the location on the mother plant from which taken. Trimming of leaves on cuttings reduced subsequent root and top growth. Given proper water, shade, and temperature, cuttings rooted in a wide range of media, among which sand, because of its abundance, is deemed satisfactory for most species. Cuttings rooted satisfactorily over a rather wide pH range. Preliminary treatment of cuttings of soft greenhouse plants with chemicals is not recommended. Varieties within a given species differed in their rooting capacity.

In seed studies a mixture of one-half sand and one-half imported granulated peat moss proved a satisfactory soil medium. Too much moisture caused rotting of seeds or the damping off of seedlings. Seeds germinated well at temperatures at which the crop made satisfactory growth.

**Planting and care of lawns,** H. L. Westover and C. R. Enlow (*U. S. Dept. Agr., Farmers' Bul. 1677 (1931), pp. II+18, figs. 10*).—A general discussion presenting information on the preparation, planting, and care of the lawn, with special reference to varieties of grasses for specific uses, such as athletic fields, golf greens, etc.

## FORESTRY

**Factors affecting the flow of maple sap,** A. C. McIntyre and H. O. Triebold (*Pennsylvania Sta. Bul. 266 (1931), pp. 24, 25, fig. 1*).—Studies showed that sap pressure is lower in the soft than in the sugar maple, accounting for a lower production of the former, other things being equal. No correlation was observed between the percentage of sugar in the sap and the size of the tree, the location of the tree, or the size or position of the tap hole. There was only about two-thirds as much sugar in soft maple sap as in sugar maple sap. When sap volume and sugar content were both considered, the sugar maple was twice as valuable as the soft maple.

**Thinning experiments in young Douglas fir,** W. H. Meyer (*Jour. Agr. Research [U. S.], 43 (1931), No. 6, pp. 537–546, fig. 1*).—Two types of thinning trees, in both cases spaced 8 by 8 ft., but with dominant trees left in one instance and various sizes in the other, were compared in an experiment begun in the autumn of 1919 in a 9-year-old Douglas fir stand near Stabler, Wash. After 10 years the plat thinned with selected dominants retained had by far the best appearance, the trees being larger and possessing wider and healthier crowns. However, in length of crown and in thickness of the branches the control trees had an apparent advantage, as natural pruning had already begun. Measurements showed that thinning had decidedly stimulated diameter growth over and above the effect of automatically raising the average diameter when the smaller trees were removed. Trees in the same initial diameter class soon covered a rather wide range of diameters. Average trees of the first measurement did not remain average as time advanced but appeared to gain. The distribution curves for all the plats were decidedly warped, with evidence of an approach to a more normal distribution.

**Vegetative changes and grazing use on Douglas fir cut-over land, D. C. Ingram** (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 5, pp. 387–417, figs. 16*).—Stating that grazing of the cut-over and burned areas during the early and critical stages of restocking is an effective method of reducing the fire hazard and at the same time utilizing profitably a secondary forest resource, the author presents the results of studies of varying degrees of grazing on regeneration. Moderate grazing was not found seriously inimical to forest regeneration and at the same time compensated for the damage by reducing the fire hazard. The principal species on cut-over Douglas fir lands soon after cutting were fireweed, bracken, and blackberry. Shortly shrubs became more important, and grasses and sedges appeared. Delaying the slash burn for about two years or reburns resulted in a lower percentage and density of the more palatable forage plants. Sheep in addition to grazing trampled down the uneaten vegetation and worked it into the soil where it became less inflammable. Sheep grazing tended to decrease the more palatable plants, although grass and sedges tended to increase.

The most significant effects of logging on vegetation were (1) the practical elimination of certain species, (2) the suppression of others due to changes in light, temperature, and moisture, (3) the encroachment of vigorous species rarely or never found in virgin timber, and (4) the stimulated growth of species held in check by the forest.

**Deterioration of chestnut in the southern Appalachians, D. V. Baxter and L. S. Gill** (*U. S. Dept. Agr., Tech. Bul. 257* (*1931*), *pp. 22, pls. 4, figs. 4*).—Stating that as a result of past and prospective blight attacks, 15,000,000,000 bd. ft. of chestnut need salvaging in the southern Appalachian area, the authors present the results of a study of the causes of deterioration of blight-killed chestnut.

The heartwood was found highly resistant to decay, especially in trees seasoned on the stump. In fact in one area studied, over 70 per cent of the first logs and 83 per cent of the second logs were sound even though the trees had been dead 25 years. Sapwood, on the other hand, decayed rapidly so that by the fourth year both sapwood and bark were beyond utilization. Lumber may be manufactured from dead standing chestnut for at least 4 years after death, and the percentage of tannin in trees dead from 25 to 30 years was not materially less than in living trees.

Among fungi attacking the sapwood of standing trees were *Polystictus pargamenus* and *Polyporus gilvus*. Related forms, *Polystictus hirsutus* and *Polyporus cinnabarinus*, were very common in slash. *P. spraguei*, *P. sulphureus*, and, in some northern sections, *Daedalea quercina* destroy the heartwood of standing timber, of structural timber, and of large pieces of slash. Viable cultures of *P. pilotae* obtained from standing trees dead for 12 years or more indicated that this heart-rotting fungus may continue to decay heartwood after the trees have died. Other fungi resembling the mycelia of *P. spraguei* and *P. sulphureus* were obtained from dead standing timber.

**Durability of Malayan timbers, F. W. Foxworthy and H. W. Woolley** (*Malayan Forest Rec., No. 8* (*1930*), *pp.* [*2*]+*60, figs. 22*).—Data on tests of the durability of Malayan timbers are presented and discussed, including the effect of treatment. A note on termites (E. S. R., 65, p. 548) is included.

**The measurement of mine props: Linear foot, top diameter, weight, and volume tables, A. C. McIntyre and G. L. Schnur** (*Pennsylvania Sta. Bul.*

*269 (1931), pp. 24, figs. 13).*—A joint contribution from the station and the U. S. D. A. Allegheny Forest Experiment Station, this bulletin presents various charts and tables constructed from measurements taken on a large number of samples and designed to assist timber owners in estimating potential cuts in the terms of mine props, trees, or logs. So little difference was found between white, red, scarlet, chestnut, and black oaks and red maple for mine props that a composite chart was made for all the species.

**The artificial drying of wood,** F. Moll (*Kunstliche Holztrocknung. Berlin: Julius Springer, 1930, pp. VI+101, figs. 35*).—This publication deals with the theory and practice of the artificial drying of timber. It contains chapters on the structure of wood, the relation of the wood mass to moisture, water absorption and water loss, variations in quality of wood resulting from dehydration, natural drying, artificial drying, artificial drying with air, structural members, and artificial drying in industries and factories.

## DISEASES OF PLANTS

**[Plant pathology at the Idaho Station]** (*Idaho Sta. Bul. 179 (1931), pp. 12, 34, 35*).—Iron and manganese inserted directly into the trunks of trees did not appear to be permanently effective in preventing chlorosis, which was particularly severe in the spring of 1930, and was accompanied by considerable visible nitrogen starvation.

In greenhouse studies with spinach it was found that the pH of the sap was not controlled by the pH of the soil.

In studies of the sclerotium disease of wheat, two organisms were isolated which differed markedly in the size of sclerotia produced in pure cultures and in temperature optima for producing sclerotia. For bunt or stinking smut in fall-sown wheat, copper carbonate dust of 50 per cent copper content used at the rate of 3 oz. per bushel is deemed the best control. Formalin spray 1-10 and formalin dip 1-40 are recommended for oat smut and covered smut of barley, respectively. Ceresan is considered promising. Three distinct physiologic forms of stinking smut were found.

Progress was made in the development of Great Northern beans resistant to mosaic, certain selections proving to be of excellent quality and high yield. Since segregation is still taking place in these lines, no homozygous resistant segregants have as yet been secured. Clover mildew was effectively checked by applications of sulfur dust, and some variation in susceptibility was seen in selected and crossed lines. Some indication was obtained in preliminary tests that strains of alfalfa resistant to bacterial wilt may be secured by selection.

**[Plant pathology at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 68-70, 236, 237, 241-245, fig. 1*).—As noted by B. Koehler, certain seed disinfectants increased the yield of oats and wheat despite the fact that there was no smut infection present on the seed. Of three materials, liquid formaldehyde, dust formaldehyde, and ethyl mercury chloride tested on oats, the last was most effective in increasing yield. Beneficial effects were also obtained in the case of scab-infected wheat and barley.

Apple measles was found by H. W. Anderson to be increasing in Illinois. The varieties Delicious and Starking were especially susceptible to the disease, which renders the trees nonproductive within three or four years. The larger limbs succumb and finally the entire tree dies. Young nonbearing orchards were often attacked and were more quickly destroyed than older trees. Attempts to isolate the causative organism were not successful, and no definite progress was made in control. The disease was not transferred by inoculation, and healthy grafts placed in a diseased tree showed no infection after two years. Other susceptible apples were Golden Delicious, Wealthy, Jonathan, and Grimes. Control suggestions include the sterilizing of pruning tools after working on diseased trees, the nonplanting of Delicious and its red sports in infected regions, and the roguing of affected trees in young orchards.

Anderson found that a commercial miscible oil (4840) and flotation sulfur gave satisfactory and economical control of scale and leaf curl of the peach. Dendrol used alone failed to control leaf curl. Combinations of oil and Bordeaux mixture gave satisfactory control, and none of the combinations injured the trees. Lime sulfur diluted 1 to 8 controlled leaf curl. The cheapest spray, the cold-mixed oil-emulsion Bordeaux mixture, is conceded potentially dangerous if improperly mixed and does not always control leaf curl. Results in a neglected peach orchard in Pulaski County showed that leaf curl may be controlled by several standard fungicides with or without oil emulsion. Oil alone controlled scale but not leaf curl, so a combined oil and fungicide is deemed essential.

Working on the bacterial spot of peach, Anderson and H. H. Thornberry found that overwintering cankers were more abundant on succulent water sprouts than on the main branches and suggest the removal of such sprouts in winter as a control measure. No spray was found capable of controlling the disease. The loss of the crop and the low rainfall in 1930 interfered with control studies. The Gage peach, believed resistant to bacterial spot, showed as much infection in 1930 as did Elberta, but since general infection was light no interpretation was made.

Winter injury to the peach may, according to Anderson and M. J. Dorsey, be reduced by the use of fertilizers and good culture. Trees in sandy soil were injured much more severely than those in loam. Drastic dehorning of winter-injured trees is not considered a good practice, it being advisable to wait until actual injury is manifested by the opening buds. Water sprouts developing from the base of Yellow Transparent apple trees are believed to be a factor in introducing fire blight into the root collar.

**[Plant pathology at the Pennsylvania Station]** (*Pennsylvania Sta. Bul. 266 (1931), pp. 17–19, fig. 1*).—Studying the behavior of fire blight bacteria when inoculated into resistant and susceptible apples and pears, E. L. Nixon found that the tissues of the Yellow Transparent apple were rapidly invaded by the zoogloeal masses, while in Williams no invasion was observed. One seedling of Kieffer has withstood six years of inoculation without infection and was used in breeding work.

Observations by Nixon on several thousand potato seedlings grown from seed taken from chance seed balls revealed an apparent broad range in susceptibility to virus diseases. Two of the seedlings, a Cobbler and a White Rural, are being tested commercially.

Tobacco studies conducted by W. S. Beach showed calomel to injure tobacco seedlings in containers that prevent leaching, while Bordeaux mixture caused no material injury and increased the stand. In outdoor beds both fungicides were safely used. One gm. of calomel per square yard gave beneficial effects on unsterilized soil, but the effective control of wildfire depended on treatment before any seedling spotting occurred. When foliage became dense, Bordeaux mixture was superior to calomel in reducing wildfire. Unsterilized cloth, boards, and aisles were factors in the carry-over of infection.

Despite the drought, wood-decaying fungi were found by L. O. Overholts to establish themselves in oak stumps, practically all stumps becoming inoculated during the first year following cutting. The fungi were *Lenzites betulina*, *Panus stypticus*, *Polyporus versicolor*, *Hydnum ochraceum*, *Stereum rameale*, *Panus rudis*, and *S. gausapatum* on 78.2, 45, 36.5, 13.9, 10.4, 6.9, and 2.6 per cent of the stumps, respectively.

**[Plant pathology at the Porto Rico Station]**, R. FERNÁNDEZ GARCÍA, M. T. COOK, ET AL. (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1930, Eng. ed., pp. 29, 30, 94–109, pl. 1; also in Porto Rico Commr. Agr. and Labor Rpt. 1930, Spanish ed., pp. 171, 173*).—*Pythium debaryanum* disease of tobacco seedlings was effectively controlled by an application to the soil of a 4–4–50 or 5–5–50 Bordeaux mixture at the rate of 0.5 gal. per square foot of surface, followed by a second application from 10 to 14 days after germination. Black shank disease (*Phytophthora nicotianae*), a very serious disease of tobacco when wrapper varieties are grown, occurred only occasionally. Potash hunger and nitrogen starvation occurred frequently in certain tobacco sections, especially on hillsides.

*Thielaviopsis paradoxa*, causal organism of pineapple rot of sugarcane, is said to interfere sometimes with the germination, particularly in the cooler months. This fungus also attacked pineapples and many other plants and was one of the most destructive parasites on the island. Fungi of the Pythiaceae family were more or less common in sugarcane roots, and nematodes also caused injury. Eye spot (*Helminthosporium sacchari*), occasionally serious, occurred abundantly on certain varieties of sugarcane. Ring spot (*Leptosphaeria sacchari*) occurred quite frequently on most varieties. Leaf spot (*Phyllosticta sacchari*) and red rot (*Colletotrichum falcatum*) were of little or no significance, but sheath spot (*Cercospora vaginae*) is deemed of considerable importance. Pokkah boeng (*Fusarium moniliforme*), serious following the cyclone of 1928, had not been harmful recently. *Helminthosporium stenospilum* brown stripe was abundant on one strain of sugarcane, while red stripe, more common than usual, was deemed of minor importance. Rind disease was considered of secondary significance. *Phytophthora palmivora*, the cause of bud rot of the coconut, was found attacking seedling citrus.

V. P. R. 12, a tobacco produced by crossing Porto Rico No. 1 and Virginia Blanco, did not outyield its Virginia parent, but did in one test yield more high-grade leaves. A strain of tobacco from Colombia was found promising.

A bacterial wilt of Solanum was compared with *Phytomonas solanaceara* and was found to check in nearly all characters, enough so as to believe it identical. The disease occurred on potato, tomato, eggplant, pepper, zinnia, *Solanum torvum*, and *S. nigrum*. All native tomatoes and peppers were susceptible, but two varieties of native eggplant were found highly resistant. Considerable progress was made in breeding resistant types possessing desirable characters.

Some of the more important plant diseases observed during the period are mentioned, with recommendations for control in some instances.

**The diagnosis of species of Fusarium by use of growth-inhibiting substances in the culture medium**, G. H. COONS and M. C. STRONG (*Michigan Sta. Tech. Bul. 115 (1931), pp. 78, figs. 7*).—Emphasizing the fact that Fusarium species are difficult except for the specialist to determine, the authors present the results of a study of the growth of different species and varieties of Fusarium upon synthetic agar containing certain dyes and chemicals. Many of the species and varieties displayed such differences in color of mycelium, in breadth of growth, in ability to change the color of a dye, or in form or type of growth as to permit positive identification. In the tests, triphenylmethane dyes were most useful but acriflavine and copper sulfate were also promising.

A total of 54 species and varieties were tested repeatedly by growing them from a uniform mass of inoculum upon a synthetic medium containing the chemical presented in a graded series of concentrations. From the variations in responses to the different aniline dyes, the varieties are grouped and a provisional key is suggested. Repetitions of the tests over a period of years substantiated the results. In fact subcultures from an original parental culture gave such closely tallying responses, despite a varied history of transfer in different laboratories, as to indicate the apparent independence of the dye responses to previous growth condition of the culture.

**A study of pathogenic and non-pathogenic strains of Pseudomonas tumefaciens Sm. & Town.**, M. K. Patel (*Phytopathology, 18 (1928), No. 4, pp. 331–343*).—The development of a method by which *P. tumefaciens* may be readily isolated from soils has made it possible to accumulate much new information about the activity of the crown gall organism in the soil.

Pure virulent cultures of *P. tumefaciens* were recovered from infested sterilized clay, loam, and quartz sand after 420 days. The infested unsterilized samples of clay, loam, and quartz sand also yielded the pathogene after 420 days, but the number of pathogenic colonies in these samples decreased in the order of clay, loam, and sand. Infection was produced from another sample of infested unsterilized clay after 424 days.

*P. tumefaciens* was recovered from artificially infested soils after subjection for 90 days to out-of-door temperatures ranging from —23 to 15° C. From infested samples buried about 6 in. in the soil the organism was recovered after 150 days of winter temperatures. In the field, in soils infested with pure cultures or diseased tissue, the organism was recovered in both cases after passing the winter in the soil in the absence of the living host.

Organisms resembling *P. tumefaciens* were recovered in 41 cases from 96 nursery soil samples, 7 of these proving pathogenic for tomato upon inoculation. In each case the pathogene was recovered from soils upon which hosts susceptible to *P. tumefaciens* were growing. Suspensions of 14 samples of soil on which nonsusceptible crops were grown for a number of years did not infect tomatoes. No colonies resembling *P. tumefaciens* were obtained from the air, tap water, or common disinfectants.

**The relation of insects to the transmission of potato leafroll and tomato mosaic in Indiana**, C. R. Cleveland (*Indiana Sta. Bul. 351 (1931), pp. 24, figs. 2*).—This paper is presented in two parts, the first of which, dealing with potato leaf roll, states that the spinach aphid (*Myzus persicae*) and the potato leafhopper (*Empoasca fabae*) are mainly responsible for insect transmission of leaf roll under Indiana conditions. The pink and green potato aphid (*Macrosiphum solanifolii*), a potential carrier of leaf roll, was not sufficiently abundant to function as a major factor in transmission. Cage tests indicated that the potato flea beetle (*Epitrix cucumeris*) is probably not an important factor. Other insects, such as *Thrips tabaci*, blister beetles, Colorado potato beetles, grasshoppers, and white flies occasionally found on potatoes, were too limited or sporadic or exhibited too little disease-carrying capacity to be deemed important.

It is believed that extremely heavy infestations of leafhoppers, by their demoralizing effect on the physiological processes of the plant and the consequent inhibition of transfer of virus to the tuber, may actually result in less spread than a moderate infestation. Aphids, on the other hand, were not as directly harmful to the plant, and the greater their number the more active they were in transmitting leaf roll. Moderate spray measures designed to check aphids and leafhoppers apparently reduced the spread of leaf roll, but were not as effective as a more extensive schedule.

The second part, dealing with tomato mosaic, asserts the belief that the spinach aphid is mainly responsible for insect transmission of the disease from tomato to tomato, and to a lesser extent from wild hosts to the tomato. The potato leafhopper, the onion thrips, and the common red spider were apparently capable of transmitting tomato mosaic, but are not deemed important. The potato aphid was not found a carrier, and little evidence was secured that the white fly is either capable of transmitting mosaic or would be likely to do so in the field. The potato flea beetle is conceded the possible ability of carrying mosaic, but is not deemed important. Insects, chiefly the spinach aphid, are held accountable for at least 50 per cent of the annual spread of tomato mosaic, and a spray schedule during the early season is suggested as desirable in reducing spread.

**Physiologic specialization in Puccinia sorghi,** E. C. STAKMAN, J. J. CHRISTENSEN, and H. E. BREWBAKER (*Phytopathology, 18 (1928), No. 4, pp. 345–354, figs. 2*).—*P. sorghi*, which may become a destructive pathogene on newly developed lines of corn and has caused considerable damage to certain inbred lines of corn grown at University Farm, St. Paul, Minn., in 1923 and 1925, was studied as to the reaction in each of 171 selfed lines of corn. All combinations of resistance and susceptibility to corn rust and corn smut appeared in the field. Collections of *P. sorghi* were obtained from many different places in the United States and one in Canada, and 45 selfed lines of corn were inoculated with most of the collections.

It is claimed that seven physiologic forms of *P. sorghi* can be recognized by their parasitic behavior on eight selfed lines of corn. Two forms were isolated from Minnesota, and one each from Texas, Oklahoma, Kansas, Nebraska, and Iowa.

**Inheritance of resistance to rust, Puccinia sorghi, in maize,** E. B. MAINS (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 5, pp. 419–430, figs. 4*).—In cooperative studies begun in 1918 by the Indiana Experiment Station and the U. S. Department of Agriculture, selections from Golden Glow 208–R and Golden Glow 202–R were found highly resistant to physiologic forms 1 and 3 of *P. sorghi*. When crossed with susceptible lines, resistance was found inherited in simple Mendelian form, the segregation in the $F_2$ generation being 3 resistant to 1 susceptible, and when $F_1$ forms were back-crossed with the susceptible parents, a ratio of 1 resistant to 1 susceptible was obtained.

Selections from Golden Bantam 996–R and Howling Mob 983–R exhibited resistance to physiologic form 1 only, and when segregation was noted in crosses between susceptible and resistant lines and in back-crosses, inheritance was found to follow simple Mendelian lines.

No case of linkage of rust resistance with other factors was observed.

**Influence of humidity on floral infection of wheat and barley by loose smut,** V. F. TAPKE (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 6, pp. 503–516, figs. 7*).—Inoculation with loose smut of the flowers of three varieties of club wheat under the humid conditions of the greenhouse at Arlington Experiment Farm, Va., resulted in infections ranging from 91 to 98 per cent. The subjection of Little Club flowers for eight days after inoculation to a low range of relative humidity resulted in a great reduction in smutted plants as compared with those held at high humidity. Under arid conditions, germinating spores were not found until the third day after inoculation, and after seven days only a few had long germ tubes. Under high humidity approximately 90 per cent of the spores had germinated and had produced long germ tubes on the third day after inoculation. Apparently under dry conditions, loose smut was checked because the spores either failed to germinate or germinated too slowly to enable the infecting hyphae to reach the ovary during the brief period that it was vulnerable.

Inoculation experiments with wheat and barley growing on desert and irrigated lands at Aberdeen, Idaho, gave comparable results. Plants grown from seed of desert-grown Moultan barley produced no smutted plants as compared with 83.9 per cent for irrigated stock. It is pointed out that the temperature range was higher in the case of the low humidity lot, but that it did not extend beyond the limits for germination of spores of *Ustilago tritici* or *U. nuda* except in the case of the Moultan barley

It is suggested that stocks free from loose smut might be produced by growing them under conditions of low relative humidity at blooming time.

**Stinking smut (bunt) in wheat and how to prevent it,** R. J. Haskell, R. W. Leukel, and E. G. Boerner (*U. S. Dept. Agr. Circ. 182* (*1931*), *pp. 20, figs. 11*).—A general discussion of the losses due to stinking smut, ways of recognizing the disease in the field and in threshed grain, methods of control, and reasons why seed treatments sometimes fail.

A survey in 1930 of 704 fields in Minnesota, the Dakotas, and Montana in which some 15 different methods of seed treatments had been employed showed that copper carbonate, formaldehyde, and Ceresan when applied by machines were the most effective materials. Failures to obtain success by seed treatment were often due to the failure to remove the smut balls and to the use of ineffective hand methods.

Comparable observations in 110 fields of Montana winter wheat showed formaldehyde when applied by a good commercial machine to be the best liquid treatment, and dusts to give excellent control when applied with commercial machines or home mixers. The desirability of annual treatments is emphasized.

**Stunting of wheat caused by Tilletia levis and T. tritici,** H. A. Rodenhiser (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 5, pp. 465–468*).—Studies at the Minnesota Experiment Station showed that both *T. levis* and *T. tritici* may cause significant reductions in the length of culms of wheat plants. The comparative degree of stunting caused by the two species depended on the physiologic forms of bunt present. For example, greater difference was seen in the degree of stunting caused by two physiologic forms of *T. tritici* than by the two species themselves. For a single species no consistent differences were observed in host reactions as regards the shape of infected heads or of bunt balls, or in the consistency of the chlamydospore mass.

**Viability of strand hyphae of the cotton root-rot fungus,** D. C. Neal and L. G. McLean (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 6, pp. 499–502, fig. 1*).—At various points in Texas, studies were made by the Bureau of Plant Industry, U. S. D. A., of the viability of the conidial stage and of the subterranean strands of the cotton root rot fungus (*Phymatotrichum omnivorum*) to determine the possible rôle in the perpetuation of the disease. Viable strands were recovered on December 10, at which time the plants were dead and the roots mostly decomposed. Excavations in January, February, and March failed to reveal the presence of strands, thus apparently eliminating them as overwintering possibilities and suggesting that the sclerotia are the active factors in perpetuation.

In the laboratory, strands maintained their viability after prolonged periods of drying in open boxes, but their rather infrequent occurrence in cotton fields in Texas suggests that the strands play an insignificant part in the hibernation of the fungus.

**Blackleg disease of potatoes in Minnesota,** J. G. Leach (*Minnesota Sta. Tech. Bul. 76* (*1931*), *pp. 36, figs. 16*).—The economic importance, symptoms, etiology, pathological anatomy, and control of blackleg, said to be one of the major potato diseases of Minnesota, are discussed. The disease causes an average annual crop loss of about 2 per cent, which may reach 50 per cent in certain fields. Furthermore, storing infected tubers under unfavorable conditions may cause heavy loss from a soft rot. Although various names have been applied to the bacteria causing blackleg, the author believes that they should be grouped under one species, for which the name *Erwinia carotovora* is suggested. The action of the bacteria on the tissues of the potato is described and is deemed essentially the same as that of soft rots of other plants.

Infection occurs in at least three ways, (1) systemic infection in which the pathogene gains entrance to tubers produced on infected plants, (2) direct infection of the seed pieces by bacteria from the soil, and (3) infection following the attack of the seed-corn maggot, through whose intestinal tract the blackleg pathogene can pass in a viable condition. Practical control suggestions are offered.

**The resistance of varieties and new dwarf races of tomato to curly top (western yellow blight or yellows),** J. W. Lesley (*Hilgardia* [*California Sta.*], *6* (*1931*), *No. 2*, *pp. 44*).—Working with certain dwarf tomatoes and the Red Pear variety, forms which had shown resistance to curly top when exposed to natural infestation by leafhoppers (*Eutettix tenellus* Bak.) it was found that the resistance was relatively weak and was lost altogether in epidemics of extreme severity. Resistance seemed to lie in escape from infection rather than tolerance of the virus. Based on five trials in four seasons, it was observed that in epidemics of moderate severity the resistant varieties above mentioned lost an average of 42 per cent of plants as compared with 62 per cent for the susceptible Santa Clara Canner, Norton, and Stone.

Attempts to isolate resistant lines from standard commercial varieties were fruitless, and no added resistance was obtained by crossing a resistant dwarf with Red Pear. However, certain promising dwarf varieties were obtained by breeding. Artificial inoculation was not found a reliable index to resistance under conditions of natural infestation. The chance of infection was influenced by the number of leafhoppers used in artificial infestation and also apparently by differences in climatic conditions. The inoculation period of the disease after artificial infestation varied from two to at least seven weeks. No significant difference was found in the length of the incubation period or in the frequency of recovery in resistant and susceptible varieties, and recovery had no effect on subsequent resistance.

**A Cytospora canker of apple trees,** D. F. Fisher and E. L. Reeves (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 5*, *pp. 431–438*, *figs. 5*).—Cytospora, a genus whose members are largely saprophytes, was found causing canker injury to one-year-old Northern Spy apple trees growing near Orondo, Wash. Since artificial inoculation produced negative results on sound apple wood and also on wood which had been winter injured but not killed, and since the trouble disappeared upon the restoration of normal growth and vigor, the authors conclude that the organism was nonparasitic, but had gained a foothold in the deadwood of devitalized trees and made some progress into adjacent live tissues.

After cleaning out the decayed tissue, cankers were painted with various materials including copper paint, copper soap, and asphaltum. The toxic effects of copper paint were noticeable on the foliage, and copper soap, though nonpoisonous, was not equal to the asphaltum in promoting healing. Strong solutions, such as alcoholic solution of zinc chloride and a mixture of sodium arsenite and linseed oil, not only injured the bark and wood tissues but the foliage as well.

**Comparative studies of certain Cladosporium diseases of stone fruits,** M. Bensaude and G. W. Keitt (*Phytopathology, 18 (1928), No. 4, pp. 313–329, figs. 8*).—Comparative studies tentatively reported (E. S. R., 50, p. 656) are here noted. The symptoms induced by species of Cladosporium on *Prunus americana, P. armeniaca*, and *P. cerasus* are described.

These forms infect the leaves of their hosts by direct penetration of the cuticle by infection hyphae from closely appressed and strongly adherent germ tubes. In cross-inoculation experiments, strains of Cladosporium from *Amygdalus persica* and *P. americana* infected *A. persica, P. americana*, and *P. armeniaca*, but failed to infect *P. cerasus* or *P. domestica*. Other experimentation is detailed.

Pathologically and physiologically, the Cladosporiums studied appear to fall into two groups, (1) those from *A. persica* and *P. americana*, and (2) that from *P. cerasus*. Tentative namings are indicated.

**Diseases of pecans in the Southern States,** J. B. Demaree (*U. S. Dept. Agr., Farmers' Bul. 1672 (1931), pp. [2]+28, figs. 21*).—Superseding Farmers' Bulletin 1129 (E. S. R., 44, p. 347), this paper discusses and describes various diseases of the pecan and presents information on their control.

**Comparative virulence of certain strains of Pythium in direct inoculation of conifers,** E. J. Eliason (*Phytopathology, 18 (1928), No. 4, pp. 361–367*).—Of 22 species and strains of Pythium tested, 19 caused damping-off in some coniferous seedlings. *Aphanomyces euteiches*, parasitic upon roots of *Pisum sativum*, caused damping-off and root rot in a few coniferous seedlings. An Alternaria and a Fusarium isolated from coniferous material gave no evidence of parasitism.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**A study of temperature and humidity conditions in common types of insect rearing cages,** R. C. Smith (*Jour. Agr. Research [U. S.], 43 (1931), No. 6, pp. 547–557, fig. 1*).—This contribution from the Kansas Experiment Station reports upon observations made largely during the summer of 1930 which are comparable with, but more detailed than, those made the previous summer by D. Wilbur, as noted (E. S. R., 64, p. 852). A description of the equipment and cages is included.

A hygrothermograph set near the cages containing rearing materials indicated very closely the temperatures to which the insects were being subjected, the cage temperatures averaging from 1.38 to 1.96° F. lower than the hygrothermograph. It did not indicate the relative humidity, which was from 12 to 60 per cent higher in the smaller and tighter cages than in the open, the average difference in two cages being 36.6 and 37.4 per cent, respectively. The temperature within cages in the insectary containing growing plants varied from 8.4° higher to 8° lower than shade temperature as determined by the dry bulb of the autohygrometer. The temperatures in cages in the sun average 3.53° higher than in the insectary, and 2° higher than official temperatures.

"There was an accumulation of water vapor, resulting largely from transpiration of plants in the air of the cages because of the interference to the free circulation of air offered by the screen wire. The wire of smaller mesh allowed less dispersion of the water vapor than the coarser wire; hence, the rate of evaporation from the atmometers in the tighter cages was less than in the more open cage. Temperature differences were negligible factors.

"Transpiration of healthy growing plants and evaporation from the surface of the soil tended to depress slightly the temperature in cages and, of course, markedly increased the humidity. The temperatures tended to equalize when the plants became unthrifty and died. The more tightly a rearing cage was closed, the higher the humidity became. Two thicknesses of cheesecloth closed a lamp-chimney cage tightly enough to produce frequently a saturated atmosphere. Since the loss of water from the atmometers in the salve-box and jelly-glass substitutes was so small, the air within must have been almost completely saturated most of the time. Cheesecloth-covered wire-screen cages gave a lower evaporation rate than cages of wire screen alone, indicating thereby a higher humidity within. A bunch of alfalfa blossoms in a cage did not affect the temperature and humidity conditions quite so much as a growing plant. When the sprigs were fresh, the humidity was higher than in the open and the temperature a little lower. As the blossoms wilted, the conditions within the cage approached those of the free air in the shade. Glass cages, such as a lamp-chimney cage with cheesecloth covers, inverted battery jar, and jelly glass, all showed markedly higher temperatures when set in the sun than when set in the shaded insectary. The humidity at the same time rapidly approached the dew point, and conditions became too moist for most rearings.

"These observations emphasized the unsuitability of the salve box and jelly glass for most rearings. The high temperatures and high humidity caused molds, yellowing of foliage put in the cage for insect food, high loss due to bacterial and fungus diseases, and abnormalities of insect behavior and habits in some cases. The presence of moist sand or soil in these cages aggravated the situation, particularly in hot weather."

**A new type of insect cage,** F. F. Smith (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 914–916, pl. 1*).—A description is given of a microcage, devised for confining leafhoppers and certain other insects to small areas on leaves or stems of plants, which seems to have certain advantages over other previously described cages.

**A chemotropometer,** J. W. Folsom (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 827–833, pl. 1, fig. 1*).—A description is given of a simple form of chemotropic apparatus and its method of operation, together with records of chemotropic reactions of the boll weevil obtained through its use.

**The use of transparent cellulose films in life history studies,** S. F. Bailey (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 898–901*).—The author has found cellophane, a transparent cellulose film of a permeable nature, to be very adaptable to the life history study of insects on their host plants. The chief disadvantage in its use out of doors is that, when wet, cellophane becomes flabby and upon drying out has a tendency to crack. Some tests were made to determine the actual conditions of temperature and humidity within cellophane cages. The results show that the atmospheric temperature and humidity with their hourly fluctuations are rather closely approximated, much more so in the case of temperature than humidity.

**[Report of work in entomology at the Idaho Station]** (*Idaho Sta. Bul. 179 (1931), pp. 29, 30*).—In referring to the western oil spray cooperative project (E. S. R., 63, p. 548), it is stated that experiments have shown that dormant oil sprays may be applied safely to apple trees in the spring only before bud scales begin to separate. The oil sprays did not injure trees which were completely dormant even when applied at or followed by freezing or subfreezing temperatures. Oil of 50 to 70 sulfonation and of not less than 100 viscosity test may be safely used for dormant spraying. Oil in combination with lead arsenate materially increases the degree of codling moth control. Oils of not less than 85 sulfonation and 65 to 75 viscosity test have proved satisfactory for foliage sprays.

The larvae that were found injuring sweet cherries in southern Idaho were reared and definitely determined to be those of the oblique-banded leaf roller.

In work with the destructive prune worm *Mineola scitulella*, nicotine sulfate proved to control the pest effectively.

Brief mention is made of the results of a study of the life history and hibernation habits of the pea weevil in northern Idaho, commenced in 1930. It was found that "(1) adults emerge in large numbers before seed goes into storage and hibernate outside of peas stored for seed; (2) most adults hibernate close to infested fields, many of them fly long distances and hibernate under the bark of coniferous trees, and some of them fly at high elevations; (3) the degree of infestation decreases in a field with the distance away from the edge, varying in a single field from as much as 25 per cent at the edge to as little as 0.2 per cent 500 ft. from the edge at harvest time; [and that] (4) it is possible to materially decrease the number of adults that escape and enter hibernation by practical changes in harvesting methods."

In a systematic study made of the leafhoppers in Idaho, it was found that the two species commonly occurring on apple and prune trees are *Empoasca maligna* and *Typhlocyba pomaria* and not the apple leafhopper and *T. rosae* as previously believed.

Brief mention is also made of the occurrence of and control work with the alfalfa weevil and the silverfish, an outbreak of the Colorado potato beetle in southwestern Idaho, the occurrence of wireworms in irrigated land, and injury to beans by the tarnished plant bug.

**[Report of work in entomology at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 139–148, fig. 1*).—In the work of 1930 (E. S. R., 64, p. 849) the extremely dry weather was found by W. P. Flint and his associates to be unfavorable to the European corn borer (E. S. R., 64, p. 857). While more than three times as many eggs were laid in 1930 in the Ohio area as was the case in 1929, the borer population was cut by the dry weather to two-thirds or even one-half of that of the preceding year. Several strains of corn have shown resistance or tolerance to the corn borer for the third consecutive year. More than a million of one species of parasite which attacks the corn borer and a number of other injurious insects were liberated in the State during the year.

In studies by J. H. Bigger of the corn rootworm it was found that large amounts of "down" corn, which produces chaffy grain, can be avoided by rotating the crop in such a way that it comes only twice in succession on a field and preferably only once during the rotation.

Work by Bigger and Flint has shown that treatments of seed corn with copper sulfate, iron sulfate, Semesan, and Dr. Buxton's corn seed treatment are of no value in checking or reducing damage to the seed in the ground or to young plantlets by white grubs, wireworms, root aphids, or corn seed beetles.

In work with the codling moth, by Flint, S. C. Chandler, M. D. Farrar, and Bigger, both laboratory and field results in 1930 showed good control through use of certain of the summer oils and very promising control with oil dusts. It is predicted that if the oil dust can be developed to a point where its efficiency compares with that of arsenate of lead sprays, it will be used by every orchardist in the State. Further work with chemically treated codling moth bands has shown that the use of these is entirely practical in the commercial orchard. One commercial orchardist banded 1,633 trees at a total cost of 4.5 cents a tree and found that an average of 164 worms had been caught under each band. Tests of codling moth bands of different widths showed that 2-in. bands caught an average of 77 larvae, 3-in. an average of 244, and 4-in. an average of 664.

The treatment, by Chandler and Flint, of three peach orchards in southern Illinois with certain tar oil sprays and oils combined with Bordeaux controlled the San Jose scale and the peach leaf curl.

In further studies by Flint and Chandler (E. S. R., 64, p. 849) of the oriental fruit moth, first discovered in Illinois in 1927, it was found to be hurt by hot, dry weather and that it can be combated with parasites. Slow progress was made in the effort to colonize the *Macrocentrus ancylivora* parasite of the oriental fruit moth in all peach sections of southern Illinois, due to the unfavorable climatic condition.

The population of the onion maggot, which often destroys from 20 to 50 per cent of the onion-set crop in the State, dropped to the lowest point in 10 years in 1930 as a result of the drought and natural insect enemies. Control work was conducted by C. C. Compton and E. P. Lewis with the two adult fly repellents naphthalene and paradichlorobenzene, the former, which was most promising, being easily applied, relatively inexpensive, and repellent for a longer period. Indirectly the drought was responsible for a general increase in effectiveness of the parasites, *Baryodma verna* and *Aphaereta muscae.* The parasitic threadworm, *Hexamermis* sp., and the predacious beetles, *Pterostichus permundus* and *P. lucublandus*, occurred in approximately normal numbers.

It was found by Compton and Lewis that substitute dusts and sprays are not as effective in combating truck crop insects as arsenate of lead and calcium arsenate, and that hand dusting machines are more efficient than garden tractor dusters in their present state of development.

The use of a 1 per cent summer oil emulsion was found by Farrar and A. S. Colby to be a promising method of controlling mites on small fruits at a reasonable cost. Four sprays applied at 21-day intervals, using an emulsion containing an 83 viscosity white oil at 1 per cent concentration, gave very satisfactory control. The sprayed plants made normal growth, while untreated plants stopped development in midsummer. Sprays were started on May 1.

Control work against the cyclamen mite, by Compton and F. F. Weinard, in which naphthalene flakes and paradichlorobenzene balls were used, resulted in the marketing by one grower of cyclamens worth $30,000 against a loss of $25,000 the preceding year as a result of damage by this pest.

In control work with the destructive greenhouse leaf tyer by Compton, the egg parasite *Trichogramma minutum* was liberated in greenhouses heavily infested with the leaf tyer at the rate of 10,000 each week from the middle of September to the first of December. Although other control practices were used, it was evident that the parasite was of considerable value in bringing the heavy infestation of the leaf tyer under control.

Steam sterilization was found by Compton to be a valuable treatment for control of symphylids, or garden centipedes.

The application made by Flint and Compton of a monochloronaphthalene emulsion controlled the ants which throw up mounds in lawns about residences and lawns and turfs on golf courses and in parks. When this emulsion was used at about 0.75 per cent strength and applied at the rate of 2 gal. per square yard, the ants were killed in the lawns and the grass was not injured.

**[Report of work in zoology and entomology at the Pennsylvania Station]** (*Pennsylvania Sta. Bul. 266* (*1931*), *pp. 30–32*).—Brief accounts are again given of the progress of work under way (E. S. R., 64, p. 155).

In studies of the oriental fruit moth S. W. Frost has found that where late varieties of peaches, such as Krummel or Salway, are grown with earlier varieties the majority of the moths migrate in the fall to the late varieties, where the greatest percentage of hibernation takes place. As a result, the highest initial infestation in the spring occurs in the late varieties, from which the moths become distributed through the other varieties in the orchard.

In work with wireworms affecting truck crops, attempts by C. A. Thomas to isolate the substance from rhubarb flowers which are attractive to *Pheletes agonus* Say were not successful. The observations indicate that there is a relation between wireworm infestation in a field and the occurrence of a grass crop at some time in that field. By knowing the species of wireworm involved and the length of its life cycle, it is possible in many cases to correlate the time of oviposition with the occurrence of a grass crop.

In the work with mushroom insects a study of the biology and control of the mite *Linopodes antennaepes* Banks, which has been very destructive locally through chewing the base of the mushroom stems and causing them to turn reddish, was commenced by Thomas. It was found that the application of steam or sulfur fumigation just before the beds are torn out and again before filling in the fall serves as an effective check. The prevention of the increase and spread of tyroglyphid mites, which feed in holes in the caps and stems, was obtained by removing sound mushrooms and then spraying the injured ones with a commercial black flag preparation. A heavy destruction of springtails in bottom beds was obtained by spreading muslin sheets on the uncased manure, scattering paradichlorobenzene crystals on them, covering all with newspapers, and leaving it for 48 hours. The fumes from the crystals killed the springtails to a depth of several inches.

Control work with the European corn borer, particularly through use of improved machinery, is reported upon by H. N. Worthley. The use in spring plowing of a 14-in. walking plow equipped with looped chain and wire was not as effective as 18-in. single and 2-bottom tractor plows equipped with experimental floating coulters and wide jointers. Disking the stalks before plowing did not aid coverage. In fitting the plowed ground, a spring-tooth harrow dragged up no more stalks than a disk harrow. A low-cutting attachment for corn binders designed to cut at ground level was found to operate as effectively as the ordinary sickle. Low evening temperatures were found at Harbor Creek to curtail moth flight, and very few egg masses could be found. Drought conditions promoted larval migration and reduced larval establishment in the plants, not more than one borer per plant having been found in the check plats in the insecticide tests, this having been the lowest infestation in the section in several years.

In work with the codling moth, Worthley found that moth emergence began in the spring of 1930 on May 11 and ended July 3, the peak falling on June 2. "Over 60 per cent of the larvae produced by these moths pupated, and a large summer brood of moths emerged from July 16 to September 2. In the fall of 1930, there were 75 per cent more larvae preparing to hibernate on the trees than in 1929. By the use of chemically treated bands placed about the trunks of well-scraped apple trees to trap the mature larvae, only 1 or 2 moths out of each 100 expected lived to emerge and produce the second brood of larvae. The bands also maintained their effectiveness against overwintering larvae, so that in December, 1930, over 90 per cent were dead. Examinations of well-scraped trees indicated that over 95 per cent of the mature larvae found their way into these trap bands. Banding shows promise of developing into a valuable control measure, supplementing spraying, for heavily infested orchards."

**[Report of the division of entomology]** (*Porto Rico Commr. Agr. and Labor Rpt. 1929, Eng. ed., p. 700*).—A brief statement is made of observations of several important insect pests of the year, including the banana root borer which is spreading throughout the island, the West Indian fruit fly and the demonstration that it does not attack citrus fruits, and five new root feeding pests of sugarcane which were found to be of great importance.

**Report of the division of entomology for the fiscal year 1929–30,** M. D. LEONARD (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1930, Eng. ed., pp. 110–123*).—In work with sugarcane root-boring animals by F. Seín, jr., the principal forms found involved were the sugarcane root caterpillar, *Perforadix sacchari;* two apparently undescribed species of bristletails (*Nicoletia* sp. and *Lepisma* sp.); a sow bug, *Philoscia culebrae* Moore; a symphylid, *Hanseniella* sp.; and nymphs of the fulgorid *Oliarus franciscanus* Stål (=*O. cinereus* Wolcott).

Considerable time was spent during the year by Seín in work with the banana root borer. Tests conducted have shown that much can be accomplished by cleaning the badly infested bulbs or so-called seed used for starting new plantings and planting them in a noninfested piece of ground, although with the best of care some eggs or small larvae will be overlooked. Preliminary control work in the field conducted on a large plantation near Guayama has shown that the systematic use of traps from which the weevils are collected daily by boys at small cost is apparently reducing the weevil population to a considerable extent in the infested parts of the plantation. Preliminary steps were taken to introduce the histerid beetle *Plaesius javanus* Er. and the leptid fly *Chrysopilus ferruginosus* Wied., both predacious upon the immature stages of the banana root borer, from Java.

The occurrence of the more important insects of the year, arranged according to the crop attacked, is noted.

In work with silkworms, flacherie, a disease due to *Micrococcus bombycis,* developed in worms from eggs received from China. A disease due to a fungus, *Botrytis* sp., possibly *B. rileyi,* also made its appearance and killed a few worms.

**[Notes on economic insects and their control]** (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 917–919*).—The contributions here presented (E. S. R., 65, p. 851) are as follows: Some Fungous and Bacterial Diseases of Pecan Weevil Larvae, by H. S. Swingle and J. L. Seal (p. 917); The Northern Fowl Mite [*Liponyssus silviarum* C. & F.], by W. E. Whitehead (p. 917); The Maple Bladder Gall (*Phyllocoptes quadripes* Shim.), by E. P. Felt (pp. 917, 918); Skunks as Grasshopper Destroyers, by W. J. Hamilton, jr. (p. 918); Demonstration of the Practical Value of Cold-Mixed Petroleum Oil Emulsions, by C. H. Richardson (pp. 918, 919); and Experiments with Japanese Beetle Traps, by E. R. Van Leeuwen and P. A. van der Meulen (p. 919).

**Soil animals attacking sugar cane,** J. W. INGRAM (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 866–869*).—In a survey made of the sugarcane fields of Louisiana, the number of soil animals and root injury was found to be greatest on heavy soils. The most numerous of the injurious species in sugarcane fields was *Hanseniella unguiculata* Bagn., with *Onychiurus armatus* Tull., *Japyx* sp., *Lepidocyrtus violentus* Fols., and *Zonitoides arboreus* Say following in the order named. After extermination of soil animals, normal numbers were reached again in two years.

**A preliminary report on arsenical substitutes for peach spraying,** S. MARCOVITCH, W. W. STANLEY, and M. V. ANTHONY (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 844–850*).—This is a report of a study by the Tennessee Experiment Station of the value of the newer spray materials, such as cryolite and barium fluosilicate, used in combating insect pests of the peach, as compared with the standard lead arsenate. Standard lead arsenate gave foliage injury at Kingston, Tenn., whereas the fluorine compounds were found safe, when used at the rate of 1 lb. to 50 gal. of water. The largest percentage of sound fruit, 81.11 per cent, was recorded for one plat receiving a dust of 50 per cent barium fluosilicate and 50 per cent sulfur. The plats sprayed with cryolite and barium fluosilicate showed 77.6 per cent sound fruit as compared with 68 per cent with lead arsenate and 5.8 per cent in the check plats. The fluorine sprays and dusts were decidedly more efficient than lead arsenate against the oriental fruit moth.

**A method of determining the relative toxicity of contact insecticides, with especial reference to the action of nicotine against Aphis rumicis,** H. H. SHEPARD and C. H. RICHARDSON (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 905–914, figs. 3*).—The authors report that a method of determining the relative toxicity of contact insecticides to *A. rumicis* L. has been devised which may be used in place of the usual spray tests in cases where greater precision is desirable. Nicotine and nicotine sulfate have been used in developing the method and to serve as standards of comparison of the toxicity of other compounds. Toxicity curves have been determined in two ways for each compound, one in which concentration is variable with time of immersion constant, whereas in the other the time of immersion is variable with concentration constant.

**Standardized oil sprays,** N. TURNER (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 901–904*).—The author suggests that viscosity, volatility, and unsulfonatable residue determinations be published in papers giving results of tests of oil sprays.

**Penetration of petroleum oils into plant tissue,** J. M. GINSBURG (*Jour. Agr. Research [U. S.], 43 (1931), No. 5, pp. 469–474*).—In the course of a study at the New Jersey Experiment Stations of the factors involved in oil injury to plant tissue and the possibility of their elimination, refined petroleum oils of various viscosities, stained red with an oil-soluble dye, were applied on the upper and lower surfaces of leaves of apple, peach, and tomato plants. The time that it took for the oil to penetrate into the leaf tissue was recorded. The same oils were also tested on apple twigs.

The results obtained, details of which are presented in tabular form, led to the following conclusions: "All the various oils tested penetrated through the undersurface of the leaf, presumably through the stomata, the rate of penetration varying indirectly with the viscosity of the oil. Only oils of low viscosity penetrated through the upper surfaces of the leaf. Oils of higher viscosities did not penetrate at all, or only slightly, through the upper surfaces of leaves. Wherever oil penetrated into the leaf, injury followed shortly after. Penetration of emulsified oils is much slower and is accompanied with less injury than that of pure oils. Petroleum oils are absorbed and conducted by the vascular bundles of apple twigs, the rate of conduction varying indirectly with the viscosity of the oil. The viscous oils either do not penetrate at all, or only to a very slight extent, through the outer cork of the twig. Only oils of very low viscosities exhibited appreciable penetration through the cork and into the cambium of the apple twig. Penetration of oil into leaf tissue as well as absorption into apple twigs vary directly with the concentration of the oil."

**Destroy the grasshopper eggs,** H. C. SEVERIN and G. I. GILBERTSON (*South Dakota Sta. Bul. 267 (1931), pp. 14, figs. 10*).—A brief discussion of the principal injurious grasshoppers of South Dakota is followed by an account of the life cycles of the four most important species. The account deals particularly with the manner of laying the eggs, the appearance of the egg pods and of the eggs, the number of egg pods and eggs laid, and the place of laying, concluding with the ways in which the eggs can be destroyed.

"Such areas as are infested with grasshopper eggs should be disked and harrowed in the fall after the first heavy frosts have killed off nearly all of the grasshoppers. If disking and harrowing is done before the grasshoppers have been killed off by cold weather, a large number of eggs may still be laid which otherwise might have been destroyed by disking and harrowing. Since the egg pods are to be found in the first 2 in. of surface soil, it will not be necessary to tear up the ground to a depth greater than 2 in. The object of disking and harrowing is to bring the egg masses or eggs to the surface of the ground where they may be exposed to the drying action of the wind and sun, or to the attacks of numerous animal enemies, such as birds, rodents, insects, and their larvae, etc. . . . A field that is infested with grasshopper eggs should be disked not only lengthwise but later it should be disked crosswise as well."

Since corn land is not usually plowed, it is recommended that such land, if infested with eggs, be thoroughly disked and harrowed late in the fall whenever possible. Grain stubble, if it is not disked and harrowed in the fall, should be deeply plowed in the fall and thoroughly disked and harrowed early in the following spring. In the case of sod land that is infested with grasshopper eggs the authors favor disking and dragging instead of deep plowing followed by disking and harrowing, first, because by exposing the eggs to the wind and sunshine they are destroyed, and second, because compacting of plowed soil is to some extent dependent upon rains and snows, two uncertain but highly important factors.

**Damage to cotton by crickets,** J. W. FOLSOM (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 807–815, pl. 1*).—New information is given on the field cricket as a cotton pest, together with the results of observations and experiments on its life history, habits, and means of control.

**Injury to varieties of eggplant by the potato leafhopper, Empoasca fabae (Harris),** F. W. POOS and C. M. HAENSELER (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 890–892, pls. 2*).—In this contribution from the U. S. D. A. Bureau of Entomology and the New Jersey Experiment Stations cooperating, the disease-like symptoms on certain varieties of eggplant which were experimentally produced by *E. fabae* are described. The susceptibility of varieties, based largely on observations in New Jersey, is discussed.

**Cage tests of the effectiveness of insecticidal dusts for the control of the cotton flea hopper,** K. P. EWING (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 821–827, pls. 2, fig. 1*).—The author reports upon a new method of conducting toxicity tests for control of the cotton flea hopper which was put into practice during the summer of 1930 and proved entirely satisfactory.

"Small cages, 18 by 18 by 24 in., covered with fine mesh brass wire cloth and designed to rest on a stool 1 ft. high, were used. Approximately 50 insects were placed in each cage for each test. By allowing the host plant to touch the top of the cage the average mortality at the end of 4 days in the check cages was reduced below 10 per cent. Seventeen insecticides, combinations of insecticides, or inert materials were tested as dusts for their toxic effects upon the cotton flea hopper. A total of 193 toxicity tests were completed, and there were also 56 cages in which the insects were left untreated as checks. In 122 of the test cages adults were placed on croton, in 49 nymphs were placed on croton, and in 22 adults were placed on cotton."

**Preliminary report on evidence that mealy bugs are an important factor in pineapple wilt,** J. F. ILLINGWORTH (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 877–889, pl. 1*).—In summarizing work in Hawaii extending over a period of four years evidence is presented to show that pineapple wilt is transmitted by the pineapple mealybug (*Pseudococcus brevipes* Ckll.), and that infection takes place only after the insect has fed upon diseased plants. The tremendous economic importance of the problem is pointed out and the interrelation with ants fully discussed. Tentative measures for dealing with this pest are considered, and the further introduction of natural enemies, particularly parasites, is recommended.

**Notes on the life history of Chaitophorus populella G. & P. (Aphididae, Homoptera)**, H. L. Sweetman and J. Wedemeyer (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 893–896, fig. 1*).—Observations are presented on the life history of *C. populella*, which was unusually abundant on *Populus* spp. and in occasional abundance on *Salix* spp. from 1927 to 1930 at Laramie, Wyo.

**Economic importance of the salt-marsh caterpillar (Estigmene acraea Drury) in Louisiana**, C. L. Stracener (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 835–838, pl. 1*).—This is a contribution from the Louisiana Experiment Stations on the economic importance of the salt-marsh caterpillar, with special reference to Louisiana, together with a brief summary of the life history and control measures.

**A new economic species attacking soybean hay in Louisiana (Herculia psammioxantha Dyar)**, W. E. Hinds (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 833–835, pl. 1*).—This contribution from the Louisiana Experiment Stations records the pyralid moth *H. psammioxantha* as having occurred during several years past in the southern part of Louisiana, attacking the soybean hay after it is cured. This is said to be the first known record of its having been of economic importance.

**Factors influencing infestation in cotton by Heliothis obsoleta Fab.**, F. L. Thomas and E. W. Dunnam (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 815–821*).—In this contribution from the Texas Experiment Station and the U. S. D. A. Bureau of Entomology cooperating, it is pointed out that there has been no definite knowledge regarding the factors responsible for the occurrence of an infestation by the bollworm.

"Experimental evidence shows that the proximity of corn to cotton has no relation to the infestation. Egg parasites, although valuable under some conditions, are not as important as the factors which influence egg deposition. Nectar and honeydew are shown to be unimportant. Throughout their growth the larvae of *H. obsoleta* show a characteristic desire for succulent food and apparently must have it for normal development. The instincts of the moths in selecting succulent plants when ovipositing have a logical foundation in the perpetuation of the species. Odors emanating from rapidly growing succulent cotton appear to be the most important factor influencing infestation in cotton by *H. obsoleta*."

**Observations on the biology of the peach borer in Roane County, Tennessee, Harriman, Tennessee, 1930**, H. G. Butler (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 851–854*).—In reporting upon the biology of the peach borer in eastern Tennessee during the summer of 1930, it is stated that the emergence began June 20 and continued until September 22, the peak having occurred the latter half of August. "The potential oviposition of the peach borer is high, the average of 9 moths examined being in excess of 700 eggs. Oviposition frequently begins within 24 hours after adult emergence. While the work of predators was quite evident, it is not considered to be of economic importance."

**Preliminary report on controlling pink bollworm in Texas by winter cultural methods**, D. A. Isler and F. A. Fenton (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 795–807, pls. 2, fig. 1*).—In this contribution from the U. S. Department of Agriculture in cooperation with the Texas Experiment Station the authors discuss the results of two years' work in Presidio, Tex., in which the best control was obtained by thorough plowing followed as soon as practicable by irrigation.

**The present status of the pink bollworm in the Southwest,** R. E. McDonald (*Jour. Econ. Ent.*, *24* (*1931*), *No. 4*, *pp. 790–795*).—This is a discussion of the present distribution of the pink bollworm in Mexico and the southwestern part of the United States and the intensity of the infestation in each area as revealed by the mechanical inspection of gin trash. The effect of low winter temperatures in a large part of the infested area on control of the insect is mentioned. It summarizes the efforts made to eradicate the rather heavy infestation discovered in the eastern end of the Salt River Valley of Arizona in the fall of 1929 by means of clean-up operations, a noncotton zone, and delayed planting dates in the restricted zone, and details some of the difficulties encountered due to the subtropical climate of that area. The results of these efforts are reviewed, and the program for the 1931 campaign is outlined.

**Suggestions on maintaining cultures of mosquito larvae through the winter,** L. C. Glover (*Jour. Econ. Ent.*, *24* (*1931*), *No. 4*, *pp. 896–898; also New Hampshire Sta. Sci. Contrib. 28* (*1931*), *pp. 896–898*).—This contribution describes the equipment used in maintaining a culture of mosquitoes (*Culex pipiens L.*) throughout the year, and refers to some ecological and life history observations.

**Methods in rearing Diabrotica,** J. M. Robinson and F. S. Arant (*Jour. Econ. Ent.*, *24* (*1931*), *No. 4*, *pp. 839–843*, *pl. 1*).—In this contribution from the Alabama Experiment Station the authors describe a rearing method for the developmental stages of different species of Diabrotica, consisting of the use of sprouting corn in glass vials 60 mm. high and 30 mm. in diameter. The moisture was retained around the sprouting corn by the use of moistened cotton. The method provided adequate conditions for a quick and accurate observation of the various stages, with a minimum disturbance to the developing insect.

**The importance of Euetheola (Ligyrus) rugiceps Lec., an enemy of sugarcane,** B. A. Osterberger (*Jour. Econ. Ent.*, *24* (*1931*), *No. 4*, *pp. 870–872*).—In this contribution from the Louisiana Experiment Stations, it is pointed out that while sugar planters have known for more than 50 years that this beetle injures sugarcane, the center of heaviest infestation appearing to have been around St. Mary Parish, there has been considerable question as to the amount of damage really done. Experimental work conducted at Franklin, La., in 1930 has shown that the destruction of the original mother stalk only in each stool would result in a decrease in yield of about 25 per cent and a loss in sugar production of about $35 per acre.

**Results of spraying and dusting experiments for the control of the curculio attacking peaches during the season of 1930,** O. I. Snapp and J. R. Thomson (*Jour. Econ. Ent.*, *24* (*1931*), *No. 4*, *pp. 854–860*).—In work conducted at the U. S. D. A. Peach Insect Laboratory at Fort Valley, Ga., large plats of peach trees of from 12 by 31 to 22 by 22 rows were used in experiments to determine the comparative effectiveness of dusts carrying 5 and 10 per cent lead arsenate and the standard lead arsenate spray and to test the value of adding fish oil to the sprays and the value of an application of lead arsenate spray when the buds are pink. Calcium monosulfide was used with lead arsenate and no lime to note the effect on the foliage.

"Heavy applications of dust (⅓ to ½ lb. per tree) carrying 5 per cent lead arsenate controlled a moderate curculio infestation as well as sprays, and the dust carrying 5 per cent lead arsenate was as effective against the insect as one carrying 10 per cent lead arsenate. The standard schedule of sprays gave as good curculio control as that with fish oil added to the sprays or that with an extra application when the buds are pink. Lead arsenate when used with calcium monosulfide and no lime gave more foliage injury than when used with self-boiled lime-sulfur containing the usual quantity of lime."

**Determination of the winter survival of the cotton boll weevil by field counts,** E. F. Grossman and P. W. Calhoun (*Florida Sta. Bul. 233 (1931), pp. 47, figs. 18*).—Following a brief introduction and discussion of field counts, hibernation cage experiments and field counts in 1926–27, 1927–28, 1928–29, and 1929–30, respectively, are reported upon, followed by a summary of the work during this entire period and a comparison of emergence from hibernation cages with field counts.

In the course of this work, contributions relating to which have been noted (E. S. R., 64, p. 549), 117,443 weevils were included in the hibernation cage tests. The survival in individual cages varied from 0.8 to 34.2 per cent. The time of emergence extended from February 28 to September 7. All of the hibernation cage tests failed to show a seasonal uniformity of emergence under the same weather conditions encountered by the field tests, which, in turn, did show a very uniform emergence rate and limited range of time during which weevils left hibernation. The field counts, which were conducted in five widely separated localities in the State, 2,157 weevils having been captured during the 5-year period, yielded uniform results. The appearance of the weevils in the field rarely extended over a period of 30 days, while the emergence period in hibernation cages extended over a period of 5 months. The peak of appearance in the field extended from June 3 to 20, while in the cage counts the peak emergence extended from March 5 to June 2. It is pointed out that the field appearance of weevils does not commence until the cage emergence is practically completed. The appearance of the weevils in the field seems to be dependent upon the temperature conditions prevailing in May and June, regardless of the nature of the weather conditions prior to that time.

The experimental data obtained during the five consecutive years indicated that boll weevils enter cotton fields in infested areas in Florida daily during the month of June. The details are presented in 25 tables and 14 charts.

**Experiments on controlling larvae of the pecan weevil by cultural methods,** T. L. Bissell (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 861–866*).—Experiments extending over a single season have shown that larvae of the pecan weevil can be prevented from burrowing into the soil under pecan trees by hand raking and rolling and to a lesser degree by raking alone, when such operations are performed just previous to the time of emergence of the larvae from the nuts.

**Synonymy and notes on the Pissodes weevil attacking Cedrus deodara,** H. Dietrich (*Jour. Econ. Ent., 24 (1931), No. 4, pp. 872–874*).—It is pointed out that the deodar cedar, a well-known southern ornamental, is seriously attacked by *P. deodarae*, described by Hopkins in 1911 as representing a distinct species (E. S. R., 24, p. 459). Observations indicate, however, that it is not specifically distinct from *P. nemorensis* Germ., which breeds commonly in the native pines. The weevil has only one life cycle a year; adults emerging in April estivate until late fall, copulate, lay eggs, and go through their life history in either Cedrus or Pinus. Repellents were of no value in keeping weevils off the deodar cedar.

**Monodontomerus aereus Walker, both a primary and a secondary parasite of the brown-tail moth and the gipsy moth,** C. F. W. Muesebeck (*Jour. Agr. Research [U. S.], 43 (1931), No. 5, pp. 445–460, figs. 3*).—Following a brief introduction, review of the literature, discussion of the distribution and technical description of *M. aereus*, its life history and habits are considered at some length and its host relations and economic importance dealt with. This parasite, first introduced into Massachusetts in 1906 from Europe, where it is widely distributed, with hibernation webs of the larvae of the brown-tail moth, has now spread throughout the area infested by this host in the New England States.

Hibernating in old cocoon masses or winter webs of the brown-tail moth, *M. aereus* emerges in April and May, oviposition generally commencing after June 1. From 172 to 352 eggs are recorded from isolated females ovipositing over periods ranging from 43 to 56 days, from 1 to 4 eggs being deposited in the host during a single insertion of the ovipositor. From 48 to 72 hours are required for incubation, followed by 4 or 4.5 days in passing through the five larval instars. Pupation takes place several days later, the pupal stage being passed in the host envelope and requiring 9 or 10 days. An average of 22 days is required for completion of the life cycle from egg deposition to emergence of the adult. Normally there is but one generation annually, about 11 months being passed in the adult stage, but there may be a small partial second generation.

*M. aereus* has been reared as a direct hyperparasite from cocoons or puparia of many primary parasites of the gipsy moth and the brown-tail moth. It has also been obtained from the pupae of certain Lepidoptera, and in these cases it has sometimes been a primary and sometimes a secondary parasite. In laboratory experiments it has been found to develop occasionally as an internal parasite in fresh tachinid puparia as well as in the pupae of the gipsy moth and the brown-tail moth, but normally *M. aereus* is an ectoparasitic hyperparasite and is sometimes a serious enemy of certain species of Tachinidae.

**The garden symphylid, Scutigerella immaculata Newport, G. A. Filinger** (*Ohio Sta. Bul. 486 (1931), pp. 33, figs. 19*).—An account given of the history and biology of *S. immaculata*, the nature of its injury, and its economic importance, is followed by a discussion of control methods, including treatments both before and after the crops are planted and supplementary control measures. The pest is said to have become of very great economic importance in greenhouses and truck fields in Ohio, the injury being done to the underground portions of the plants and to parts coming in contact with the soil. The plants are stunted and may be killed outright. Under laboratory conditions from 40 to 60 days are required for the symphylid to become sexually mature, and individuals have been kept alive in the laboratory for 2 years and 4 months.

In greenhouses the symphylid may be controlled by thorough steam sterilization, using the tile method, if they are in the upper soil strata when the work is done. "Steaming in midsummer when the symphylids are deep in the subsoil or at any season if the pan or harrow methods are employed will not give satisfactory results. In every instance observed where failure to control by steam sterilization has been reported it has been found that either lack of thoroughness or improper timing of the work has been responsible.

"Raised benches, where these are practical, have solved the symphylid problem. Soil fumigants which have been found beneficial when put on the subsoil are paradichlorobenzene, calcium cyanide, and carbon bisulfide. Paradichlorobenzene may stunt the first crop following its application, particularly if planting is done too soon after the treatment. Some relief was obtained by drilling carbon bisulfide on both sides of rows 4 in. from the base of the plants.

"Thoroughly working an infested soil between crops when the creatures are in the surface layers always checks their activity. Careful watering at the time of planting is also beneficial in keeping the symphylids from plant roots.

Carbon bisulfide emulsion poured on the surface of the soil failed to control the garden symphylid. The garden symphylid is spread by introduction of infested soil, infested manure, or on infested plant roots. It may also migrate into greenhouses under walls from adjoining fields. In California, flooding is reported as being the only practical method of control under outdoor conditions."

**The two-spotted mite (Tetranychus telarius L.) on Asparagus plumosus,** J. W. Wilson (*Florida Sta. Bul. 234* (*1931*), *pp. 20, figs. 6*).—This is a summary of information on a mite, found from Maine to Florida and as far west as Texas, which is at the present time a source of injury to the ornamental asparagus *A. plumosus* in four localities in Florida. This mite has been found to feed and reproduce on 21 species of weeds growing in ferneries, preferring nightshade, cudweed, and tea weed to *A. plumosus*.

"The mites puncture the tissue of the tender shoots beneath the bracts and withdraw the plant juices, thus dwarfing the shoots and preventing normal development. Large numbers of mites cause the plants to turn brown as if they were burned. During the winter months development progresses slowly and the mites are rather scarce, but they may be found in the fernery. They are most abundant during the dry warm spring months, usually April, May, and part of June. When the summer rains begin the mite population is reduced. Incubation period for the eggs averaged about 6 days for the entire year, but was about 4 days during the hotter months. The larval stage averaged about 3 days and each of the 2 nymphal stages 3 and 4 days. Each adult female will lay an average of 70 eggs at the average rate of 3 to 7 per day. The average time required for the completion of each generation was found to be 14.64 days, which indicated that there are approximately 24 generations a year."

The mites travel to a certain extent from plant to plant, have been transported on infested seedlings, and may be carried considerable distances by the wind. Heavy rains decrease their numbers and hold them in check from the latter part of June until the warm dry weather of the succeeding spring. They may be held in check artificially by frequent use of a sprinkler irrigation system. Two natural enemies of the mite were observed during the course of the investigations of ferneries at Pierson, the mite *Seius quadripilis* feeding upon the eggs and the predacious thrips *Scolothrips sexmaculatus*. White oil emulsions were found to be the safest and cheapest of the insecticides tested in the experimental control work. "If the plants are wet thoroughly with a solution made up of white oil emulsions, 1–100, at 7-day intervals, control of the mites can be obtained. Solutions of a derris compound will also give good control of the mites, but the white oils are recommended because they are much less expensive. A spray machine, capable of applying 500 to 600 gal. of spray material to the acre at a pressure of about 200 lbs., should be used to wet thoroughly all plants and every mite on them. A second spray must be applied 7 days after the first in order to destroy the mites that have hatched out after the first spraying."

## ANIMAL PRODUCTION

**[Experiments with beef cattle in Illinois]** (*Illinois Sta. Rpt. 1931, pp. 78–84, fig. 1*).—The results of studies by H. P. Rusk and R. R. Snapp, some of which have been continued (E. S. R., 64, p. 862), are noted.

*More tests prove high acre-value of ear corn silage.*—In this study approximately 40 acres of corn were divided into lands of 60 rows each. In September 40 of these rows were harvested as ear-corn silage, and the remaining 20 rows were left standing until November, when the corn was husked. A group of 30 steer calves were fed a ration of ear-corn silage, alfalfa hay, and cottonseed meal, while a group of 15 similar steers received corn-and-cob meal, alfalfa hay, cottonseed meal, and oat straw. The calves in the respective lots made average daily gains of 2 and 1.94 lbs. per head. The steers receiving the ear-corn silage sold at a higher price per hundredweight and returned 35 cts. per bushel of corn fed as compared with 10 cts. per bushel for the corn-and-cob meal.

*Summer-fed steers pay well for temporary pastures.*—Two lots of 21 calves each were fed for a winter period of 119 days on a basal ration of normal corn silage and green stover silage, respectively. In addition each calf in both lots received 1 lb. of cottonseed meal and 2 lbs. of clover hay daily. The stover silage calves also received oats in amounts equal to the shelled corn in the normal silage lot. A small amount of shelled corn was fed the last week to accustom the calves to the feed before going on pasture. At the end of the winter season the calves were redivided into four lots, three of which were full-fed for 183 days on bluegrass, sweetclover, and mixed timothy-clover pasture, respectively, while the fourth lot was grazed without grain for 90 days and full-fed in dry lot for 93 days. The sweetclover steers were full-fed in dry lot after 117 days on pasture. During the winter months the average gains were the same in both lots, and the cost per hundredweight at the end of the winter period was practically the same. During the pasture season the steers in the respective lots made average daily gains of 1.96, 2.28, 2.42, and 1.83 lbs. per head. The return per bushel of corn fed during this period was 81 cts., $1.08, $1.16, and $1.20, and the return per acre of pasture was $16.86, $33.44, $46.08, and $16.06 in the respective lots.

*Corn silage proves right to wider use as cattle feed.*—Three lots of calves were fed for 242 days. One lot received corn-and-cob meal, alfalfa hay, and oat straw; the second lot, shelled corn and clover hay; and the third lot, shelled corn, corn silage, and alfalfa hay. The average daily gains in the respective lots were 1.94, 2.13, and 2.06 lbs. per head. The cost per 100 lbs. of gain was cheapest in lot 3 and highest in lot 2, while the selling price per hundredweight was highest in lot 2 and lowest in lot 1. The loss per head was not quite so much in the silage lot as in the other two lots.

*Wheat fed to steers pays more than dollar a bushel.*—To determine the value of wheat for steers four lots of 2-year-old steers were fed in dry lot for 94 days. The basal ration of cottonseed meal and clover hay was fed to all lots. The grain ration in the respective lots consisted of shelled corn; shelled corn and ground wheat equal parts; shelled corn, ground wheat, and ground oats equal parts; and ground wheat and ground oats equal parts. The average daily gains in the respective lots were 2.32, 2.42, 2.58, and 2.36 lbs. per head. The wheat fed in lot 2 reduced the cost of gains and increased the selling price and the profit when compared with the ration fed in lot 1. The ration fed in lot 3 was slightly better than that fed in lot 2 and considerably better than that fed in lot 1. In lot 4 the ration, while not producing as rapid gains as those made in lots 2 and 3, was the most economical ration in cost per 100 lbs. of gain.

*Old notions on superiority of rolled feeds upset.*—In determining the value of rolled feeds two lots of 10 2-year-old steers each were fed in dry lot for 94 days. One lot received ground wheat and ground oats equal parts and the other lot rolled wheat and rolled oats equal parts. In addition both lots were fed clover hay and cottonseed meal. The average daily gains in the respective lots were 2.36 and 2.15 lbs. per head. The steers in lot 1 returned a profit of $13.06 above feed and cattle costs, while those in lot 2 returned $8.15 per head.

**[Meat studies in Illinois]** (*Illinois Sta. Rpt. 1931, pp. 85–88, 98, fig. 1*).—The results of several experiments are noted.

*Tough, dark beef not caused by exercise of steers.*—This is a continuation of the study previously noted (E. S. R., 64, p. 860). One steer in each of eight pairs was exercised approximately 3.5 hours per day on a treadmill in a study by H. P. Rusk, H. H. Mitchell, T. S. Hamilton, S. Bull, and F. C. Olson. The exercised steers walked the equivalent of 1,181 miles on the level, or 8.8 miles per day at the rate of 3.1 miles per hour. The weights of each pair were kept similar by regulating the feed.

The exercised steers dressed better and with one exception made better carcasses than the unexercised steers. There were no differences in cutting percentages and physical composition of the wholesale cuts or carcasses that could be traced to exercise. The livers of the exercised steers were larger than those of the unexercised steers, but this was the only difference in the internal organs. There was no difference in the firmness of fat or lean. Exercise did not affect the color, except in the case of the triceps brachii which was darker and redder in the exercised steers. There was no difference in the palatability of roasted ribs except that the ribs of the exercised steers were tenderer.

The collagen content of the uncooked muscles of unexercised steers was higher than in exercised animals. The hemoglobin content of the muscles, heart, liver, and blood was not affected by exercise nor was the fat content of the muscles of the chilled carcass. The ether extract of the heart, liver, and fresh round was significantly less for exercised steers. The tissue samples from exercised steers contained less moisture, especially those from the liver, flank muscle, and fresh round. Exercise lowered the creatine content of muscle, and this extractive is probably the most important in contributing to the flavor of meat.

*Fowler's solution may be a cause of "black cutters."*—A study to determine the effect of Fowler's solution upon the color of lamb carcasses was undertaken by Bull, Olson, and W. G. Kammlade. Medium-grade Texas lambs were divided into 2 lots of 10 head each. In lot 1 the lambs were given 6 drops each of Fowler's solution per day, and the dosage increased 2 drops per day until they received 64 drops. After 30 days 5 lambs in each lot were slaughtered. The remaining lambs in lot 1 received an increase of 4 drops daily until they were getting 128 drops, when all lambs were slaughtered. None of the lambs showed any signs of arsenic poisoning, and all carcasses, except one in the check group, had poor color. The carcasses of lambs fed Fowler's solution for short periods ranged in color from reddish to violet-purple. Those fed the solution for the longer period were worse in this respect. Six of the lambs receiving no solution were "black cutters."

*Barrows and gilts about equal in pork produced.*—Using the animals in a previous study (E. S. R., 61, p. 460; 65, p. 367), it was found by Bull and Olson that 240 barrows averaging 225 lbs. dressed on the average 78.06 per cent and 205 gilts of the same weight dressed 77.57 per cent. The average yield of hams from the gilts was 18.04 per cent and from the barrows 17.66 per cent. In the yield of other cuts and in percentage of fat in both the entire carcass and bacon belly there was no significant difference between barrows and gilts.

**Steer feeding [at the Caldwell, Idaho, Substation]** (*Idaho Sta. Bul. 179* (*1931*), *pp. 41, 42*).—In this study it was found that 534 lbs. of barley in an alfalfa hay and barley ration were equal to 251 lbs. of alfalfa hay and 1,515 lbs. of corn silage in an alfalfa hay-corn silage ration for producing 100 lbs. of gain. Steers fed grain gained faster and attained a higher finish. A ration of alfalfa hay, barley, and corn silage produced faster gains than either alfalfa hay and barley or alfalfa hay and silage and also produced a higher finish. The addition of cottonseed meal to a ration of alfalfa hay, corn silage, and barley did not increase the gains or lower the feed requirements enough to justify its use.

**[Experiments with sheep at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 99, 100*).—W. G. Kammlade has continued these studies with sheep (E. S. R., 64, p. 863).

*Soybean hay makes excellent feed for bred ewes.*—In this study 2 lots of 39 Corriedale ewes each that had been bred to Southdown rams were fed from December 22 to May 4. One lot received soybean hay, salt, and water, and the other lot soybean hay, sheaf oats, salt, and water. During the 84 days following the start of the test, the ewes fed daily 1.02 lbs. of sheaf oats instead of a like amount of soybean hay gained 5.2 lbs. more per head than those fed hay only. A loss of weight during the suckling period indicated the need of liberal feeding. The lambs from both lots were of good size, vigorous, and well developed at birth. The ewes showed no lack of nursing ability, and there were no digestive disturbances in either lot.

*Wheat found less valuable than corn in lamb feeding.*—During a 57-day period 150 black-faced lambs were divided into 6 lots and fed to compare wheat and corn. Lambs fed whole wheat and alfalfa hay made 8.1 per cent less gain and required 6.9 per cent more grain and 7.3 per cent more hay to produce 100 lbs. of gain than lambs fed like amounts of shelled corn and alfalfa hay. Ground wheat was less palatable than whole wheat and the rate of gain was lower on this feed, but the amount of grain required to produce 100 lbs. of gain was also less. Substituting whole oats for half of the whole wheat did not increase the efficiency of the ration. Rolled wheat was not equal to ground wheat. There was some tendency toward bloating in all wheat-fed lots. Self-fed lambs gained 28 per cent faster, but required 6.8 per cent more ground wheat and 15 per cent less hay for each 100 lbs. of gain than hand-fed lambs.

**[Sheep experiments in Pennsylvania]** (*Pennsylvania Sta. Bul. 266 (1931), pp. 14, 15*).—The results of two studies are noted.

*Hothouse lamb production*, W. L. Henning.—Continuing this study (E. S. R., 63, p. 660), a lot of 29 Merino ewes was bred to a Corriedale ram, and a lot of 33 Dorset-Merino ewes was bred to a Southdown ram. The lambs in the first lot were sold at an average age of 7 weeks weighing 29.5 lbs. per head, while those in the second lot were sold at an average weight of 29.7 lbs. at 5.7 weeks of age. The lambs from the Dorset-Merino ewes were blockier, thicker, and had more desirable cutting carcasses than the lambs from the Merino ewes.

*A comparison of native fine wool lambs, native mutton lambs, and western bred lambs as feeders in Pennsylvania*, W. L. Henning et al.—In this study (E. S. R., 64, p. 165), 6 lots of 28 lambs each were fed for 77 days. The lambs in lots 1 and 2 were native fine wool lambs; in lots 3 and 4, native mutton lambs; and in lots 5 and 6, western range lambs. The ration fed to lots 1, 3, and 5 consisted of shelled corn, linseed meal, mixed hay, and silage, while lots 2, 4, and 6 received the same ration without silage. The average daily gains in the respective lots were 0.25, 0.27, 0.24, 0.22, 0.33, and 0.35 lb. per head.

**[Lamb feeding in Idaho]** (*Idaho Sta. Bul. 179 (1931), pp. 40, 41*).—The results of two studies are noted.

*Lamb feeding investigation [at the Aberdeen Substation].*—Clover or alfalfa chaff replaced from one-third to one-half of the alfalfa hay in a ration of barley and alfalfa hay without materially changing the gains and feed requirements. The gains of lambs tended toward growth rather than fattening when chaff replaced as much as one-half of the hay. When not more than one-third as much chaff as hay was fed, a finish was produced equal to that of the lambs fed barley and hay alone. When fed in this manner chaff had about 50 per cent the feeding value of alfalfa hay. Adding beet molasses to the clover or alfalfa chaff did not change the gains or feed requirements.

*Animal feeding investigations [at the Caldwell Substation]*.—The gains and feed requirements were practically the same for lambs fed in open lots as for those fed in sheds. It required about the same amount of corn, wheat, and barley to produce 100 lbs. of gain, but wheat-fed lambs did not gain as fast or have as good finish as the other lots. Adding cottonseed meal to a barley-alfalfa hay ration increased the gains and finish of lambs, but did not decrease the grain requirements enough to affect the increased cost of gains. Adding corn silage to the barley-alfalfa hay ration did not increase the gains nor materially affect the feed requirements, but the further addition of cottonseed meal increased the gains, improved the finish, and reduced the feed requirements. Replacing 20 per cent of the barley with cull beans reduced the gains slightly and materially increased the feed requirements.

**[Swine studies at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 89, 90, 91, 94–98, 101–105, figs. 2*).—These are continuations of studies previously noted (E. S. R., 64, p. 864).

*Cottonseed proteins less valuable than linseed proteins.*—The nutritive value of the proteins of cottonseed meal and linseed meal fed alone and combined in a 1:1 ratio with the proteins of corn for growing pigs was studied by H. H. Mitchell and T. S. Hamilton. The average coefficients of apparent digestibility were 76 and 86 and the true digestibility 83 and 94 for cottonseed meal and linseed meal proteins, respectively. The biological values obtained were 63 and 61, respectively. No supplementing effect between the proteins of these oil meals and those of corn was found, the combinations giving values of 61 and 61, the same as the values for corn proteins. For both rats and pigs the digestible proteins of the two meals were equally well utilized for maintenance and growth.

*May have start toward rapid- and slow-gaining pigs.*—The second crop of fourth-generation pigs in this study by W. E. Carroll, G. E. Hunt, and E. Roberts made average daily gains from birth to 180 days of age which varied among the boars from 0.59 to 1.18 lbs. and among the sows from 0.55 to 1.24 lbs. per head.

*Earlier findings on oats rations for swine confirmed.*—In a test by Carroll, Hunt, and R. H. Goold, 4 lots of 20 pigs each were fed from average initial weights of 70 lbs. to final weights of 200 lbs. A protein supplement composed of tankage, linseed meal, and alfalfa meal 2:1:1 was fed to all lots. In addition the respective lots received corn; corn and oats 2:1; corn and oats 1:1; and shelled corn and whole oats self-fed free choice. The average daily gains in the respective lots were 1.66, 1.59, 1.51, and 1.5 lbs. per head. An increase in the amount of oats eaten, except in the case of those fed free choice, decreased the rate and economy of gains.

*High-priced minerals not needed in swine rations.*—In a series of metabolism studies with 5 young pigs, Mitchell and Hamilton fed a basal ration of 91 per cent of corn, 6 per cent of dried egg albumin, 2 per cent of cod-liver oil, and 1 per cent of salt. Calcium carbonate, tricalcium phosphate, dicalcium phosphate, or monocalcium phosphate were added to the basal ration in amounts to provide 2 gm. of calcium for each 1,000 gm. of ration. There were no significant differences in the utilization of dicalcium and tricalcium phosphate. The calcium of calcium carbonate was somewhat less well utilized on the average than that of dicalcium phosphate, although in two cases a higher percentage retention of calcium occurred with the carbonate supplement. The percentage retention of phosphorus was higher on the carbonate supplement than on the phosphate supplement. However, the daily balance of phosphorus averaged 1.95 gm. in the latter case as compared with 1.47 gm. on calcium carbonate. Dicalcium phosphate seemed to be appreciably better utilized, both with respect to calcium and phosphorus, than the monocalcium phosphate.

*Shrinkage in truck v. rail shipping studied further.*—R. C. Ashby made a study of the weight reports received on 2,944 hogs marketed by truck and 3,487 hogs marketed by rail. With hogs given a full feed at the farm and marketed by truck the shrinkage was less than with hogs marketed by rail. With hogs given less than a full feed at the farm the difference was even more in favor of the truck. A comparison of truck hogs not fed or watered at the market with rail hogs fed and watered showed that the shrinkage by truck was less than by rail when hogs were given a full feed at the farm, but when less than a full feed was given the shrinkage by truck was much higher than by rail. The shrinkage on truck shipments moving more than 36 miles was practically the same as for shipments by rail, but when the distance was more than 55 miles shrinkage by truck was appreciably higher than by rail.

**Fattening rations for swine, M. A. McCarty** (*Pennsylvania Sta. Bul. 266 (1931), pp. 15, 16*).—Continuing this study (E. S. R., 64, p. 165), 3 lots of 8 pigs each were fed from an average initial weight of 70 lbs. to an average final weight of 200 lbs. per head. Lot 1 was fed a ration consisting of ground shelled corn, ground oats, standard middlings, and tankage 4 : 3 : 2 : 1; lot 2 received the same ration except that ground barley replaced a like amount of ground oats; and lot 3 was fed ground corn, middlings, and tankage 7 : 2 : 1. The average daily gains in the respective lots were 1.53, 1.62, and 1.61 lbs. per head. The ration fed in lot 1 was the least desirable from the standpoint of rate and economy of gains, while that fed in lot 2 was the most desirable in this respect.

**Hay requirements of city work horses, J. A. Simms and J. O. Williams** (*Connecticut Storrs Sta. Bul. 173 (1931), pp. 29, figs. 14*).—In cooperation with the U. S. D. A. Bureaus of Animal Industry, Public Roads, and Agricultural Economics, this study was undertaken to determine the hay requirements of horses doing work on city streets. The trials were conducted in two series, one with horses used in delivering ice and the other with horses used by a dairy. In all trials the horses were divided into three lots, and the respective lots received 8, 12, and 16 lbs. of hay per head daily in addition to the grain mixture.

The first trial in series 1 was of short duration, and no conclusions were drawn. In the second trial, which lasted 36 weeks, there were no marked differences in the three lots. However, the trend of the data showed that on 8 lbs. of hay there was an average loss of 17 lbs., on 12 lbs. of hay a loss of 8 lbs., and on 16 lbs. of hay a gain of 10 lbs. per head. In this trial all the animals received 15 lbs. of grain daily. These results indicate that under the conditions of the test 14 lbs. of hay, or 1 per cent of the live weight, constitutes the optimum amount of hay.

In the second series three lots of horses were fed for a total of 314 days, and in this trial the grain was adjusted to the changing weights of the animals. No differences were noted in the horses of the three lots in their ability to perform work, in health, appetite, or spirit. The somewhat greater increase in the weight curves in lots 2 and 3 receiving the larger amounts of hay indicated that the grain allowance of these lots might have been reduced more.

Under the conditions of the study it appeared that 8 lbs. of hay per head daily were sufficient for horses doing this type of work. The cost of feed per head per day was somewhat greater when 12 lbs. of hay were fed instead of 8 lbs., while when 16 lbs. of hay were used the cost increased still further. This would indicate that at the usual ratio of grain and hay prices in cities the increments in feed can be made more economically in grain than in hay.

**[Poultry studies at the Idaho Station]** (*Idaho Sta. Bul. 179* (*1931*), *pp. 12, 35–37*).—The results of several studies, some of which have been previously noted (E. S. R., 63, p. 561), are reported.

[*Blood as an index of health and body functions of laying hens*].—The level of animal protein in the ration of laying birds as well as production, body weight, and health was found to have a marked influence on the amino acid content of the blood. A continued high level of animal protein had a decided influence on blood composition and was detrimental to health.

Groups of birds were fed animal protein in the following amounts: 0, 7.5, 11.25, and 15 per cent of the ration. Egg production increased with the higher levels of animal protein. The average body weight of the hens was higher in groups 2 and 3 than in groups 1 and 4, both at the end of a year and on the average throughout the year. Groups 2 and 3 were also noticeably healthier than the other groups. Feed consumption was higher in groups 3 and 4 than in group 1.

*Humidity in relation to hatchability of eggs*.—Using a cabinet type of incubator in which the air was kept in constant circulation produced better hatches in a series of 8 hatches when an average relative humidity of from 46 to 48 per cent was used during the first 18 days of incubation, and an average of from 52 to 53 per cent from the eighteenth day to the end of the hatching period. The average weight loss of eggs due to evaporation for the first, second, and third 6-day periods was 3.75, 3.94, and 4.31 per cent, respectively.

Studies with turkey eggs showed that the better hatches were obtained when the percentage loss of weight due to evaporation was but little more at 24 days than for hens' eggs at 18 days. To secure this it was necessary to have a higher humidity which would slow down the rate of evaporation.

*Turkey management*.—Young turkeys fed an all-mash ration weighed 1.09 lbs. each at 4 weeks of age. At this time a scratch mixture of equal parts of cracked corn and wheat was fed twice a day, and mash was before the birds at all times with chopped alfalfa hay in racks. At the end of 24 weeks the average weight of hens was 11.45 lbs. and of toms 16.69 lbs.

*Influence of alfalfa on yolk color*.—In continuing this study little difference was found in the percentage of dark-yolked eggs due to the feeding of dry or soaked alfalfa leaves.

**[Poultry studies in Illinois]** (*Illinois Sta. Rpt. 1931, pp. 113–117*).—These results are continuations of studies previously noted (E. S. R., 64, p. 867).

*Surgery does not help hens which once laid heavily*.—L. E. Card and E. Roberts were not able to stimulate egg production by scarifying or mutilating the ovarian tissue of hens which once had been heavy layers. Pairs of hens were fed and managed in the same way, and one hen of each pair was operated upon on November 7. Up to April 8 the average egg yield of 13 operated hens was 10.9 and of 13 controls 16.2 eggs. The range of production was from 0 to 32 eggs for the operated group and from 0 to 78 eggs for the controls.

*Hens seem to make better use of smaller feedings*.—Studies by T. S. Hamilton and T. E. Aspinall indicated that hens used small amounts of feed to better advantage than large amounts.

*Improved method of feeding cod-liver oil is sought*.—In a test by H. J. Sloan and Card chicks which received cod-liver oil every other week at levels of 0.75, 1, 1.25, and 1.5 per cent and those which got it every third week at a 1.5 per cent level grew as well as chicks which received the oil continuously at a 0.5 per cent level. Chicks fed cod-liver oil every fourth week at a 2 per cent level did not grow as well as chicks in the other lots, although there were no signs of rickets. Chicks fed 0.25 per cent of cod-liver oil continuously did as well as those fed 0.5 per cent continuously.

*Plenty of needed vitamin E in ordinary poultry feeds.*—Continuing this study (E. S. R., 62, p. 552), Card, H. H. Mitchell, and Hamilton fed pullets from an age of 8 weeks on a ration which had been treated to destroy vitamin E. At about 1 year of age they were mated to normal males, and the eggs were saved for hatching. No eggs hatched until wheat germ oil was added to the ration. When fed at the rate of 0.5 cc. per head daily the oil produced an immediate and marked effect. The oil was fed for 28 days, and eggs set on the seventh, fourteenth, twenty-first, and twenty-eighth day hatched at the rate of 32.6, 61.7, 61.7, and 69.4 per cent, respectively. When the oil feeding was discontinued the percentage of hatchability fell off immediately, the next two hatches being 29.5 and 3.4 of the eggs set. Cockerels fed for 9 months on a ration lacking in vitamin E were able to fertilize eggs which hatched normally.

*Chicago could use more high-quality Illinois eggs.*—Card and F. E. Elliott found that, while there was a certain preference for white-shelled eggs on the Chicago market, customers were primarily interested in good quality. U. S. specials sold for from 10 to 17 cts. a dozen over trades in 25 stores. Of the customers buying specials 78 per cent gave as their reason that they were the best available, while 83 per cent of the users of trades bought because of their price. Chicago consumers showed a stronger preference for pale yolks than for orange yolks, but not as strong as for the medium and orange combined.

**[Experiments with poultry at the Pennsylvania Station]** (*Pennsylvania Sta. Bul. 266 (1931), pp. 6–8, 29, 30, fig. 1*).—The results of several experiments, two of which have been continued (E. S. R., 64, p. 168), are reported.

*Hock disease in poultry*, J. E. Hunter, R. A. Dutcher, and H. C. Knandel.—Experimental hock disease has been induced in 90 per cent of the birds by additions to the ration of such materials as bone meal, sodium phosphate, calcium carbonate, and " balanced mineral mixtures." Decreased amounts of the above-mentioned materials tended to lessen or prevent the disease, and the presence of protein concentrates rich in organic salts aggravated the condition when " salt mixtures " were fed at the same time. The disease was most prevalent in battery brooders. Liberal amounts of oats and oat feed supplied beneficial properties which could not be explained on the basis of their fiber content.

*The bone-building value of cod-liver meal, fish meals, and alfalfa leaf meal*, J. E. Hunter, R. A. Dutcher, and H. C. Knandel.—In this study it was found that 10 per cent of cod-liver meal was necessary to promote normal bone calcification, and that the ash of this supplement did not prevent rickets. Either menhaden or haddock fish meal at a 10 per cent level produced satisfactory bone calcification, while their ash produced only slightly lower calcification. Neither alfalfa leaf meal nor its ash showed any appreciable antirachitic effect.

*Does vitamin A possess vitamin D-sparing properties when fed to chicks?* J. E. Hunter and H. C. Knandel.—Varying amounts of artificially dried alfalfa, deficient in vitamin D but rich in vitamin A, were fed with cod-liver oil or ergosterol, whch furnished various levels of vitamin D. The chicks were kept on the various rations for 8 weeks and then slaughtered, and the bone ash determined. There were no indications that vitamin A in the form of alfalfa had any sparing properties in the vitamin D furnished either by cod-liver oil or ergosterol.

*The response of the growing chick to cod-liver oils of varying acidity*, J. E. Hunter, R. A. Dutcher, and H. C. Knandel.—Chicks were fed vitamin D-deficient rations, to which were added from 0.5 to 1 per cent of cod-liver oils varying in acid content from 1 to 18 per cent. At the age of 8 weeks the chicks were slaughtered, and the amount of bone calcification was determined. It was found that 0.5 per cent of any of the oils was sufficient to promote good calcification, but it was impossible to draw any correlation between the acidity of the oil and the growth and livability of the chicks.

*Inheritance of egg production in Single Comb White Leghorns and Barred Plymouth Rocks*, E. W. Callenbach.—Statistical studies showed that, except for day-old weights, the weights of a chick at different ages were definitely related. The heavier the chick at a certain age, the heavier it was likely to be at a later date. The heavier pullets at first egg laid the heavier first eggs, and the older the bird at first egg, the heavier was the egg laid. These results were equally true of both breeds.

**Effects of cod-liver oil and ultra-violet irradiation, as influenced by oyster shell, in the diet of confined laying hens,** W. A. Hendricks, A. R. Lee, and A. B. Godfrey (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 6, pp. 517–535, figs. 6*).—Rhode Island Red pullets approximately 5 months of age were divided into 6 pens of 15 birds each by the U. S. D. A. Bureau of Animal Industry and were confined for a period of nearly 2 years in such a manner that all sunlight reaching the pens passed through glass. The birds were fed a basal diet containing 18.44 per cent of crude protein and 6.85 per cent of ash. In addition the birds in pens 4, 5, and 6 received crushed oyster shell ad libitum. About 3 months after the start of the experiment pens 3 and 6 received 2 per cent by weight of cod-liver oil added to the mash, and pens 1 and 4 received 15 minutes of ultra-violet irradiation daily. Eight months after the start of the experiment oyster shell was removed from pens 4, 5, and 6 and added to pens 1, 2, and 3. The effect of the change was so pronounced that a little over a month later oyster shell was fed to all 6 pens. Records and observations were kept on egg production, egg weight, weight of eggshell, fertility and hatchability of eggs, and health and condition of birds.

The study showed that feeding cod-liver oil to, or irradiating with ultraviolet light, the hens confined without access to direct sunlight or green feed increased egg production and thickness of eggshell and improved the general condition of the birds. Both supplements showed tendencies toward increasing egg weight and hatchability of eggs. The cod-liver oil was superior to the type of irradiation used in this study. When no cod-liver oil was included in the diet of the confined birds, the addition of oyster shell increased egg production and shell thickness, even though a mineral supplement was present in the basal diet. It was evident that oyster shell was either a source of easily available mineral or contained a small amount of some factor present in cod-liver oil.

**The use of peanut meal as a source of protein in starting mashes for chicks,** R. L. Bryant (*Virginia Sta. Bul. 281* (*1931*), *pp. 13, figs. 5*).—A series of four trials, using day-old Barred Plymouth Rock chicks, was conducted to study the growth, general health, and mortality of chicks fed varying amounts of peanut meal as compared with meat scrap and to compare the feed consumption and cost per unit of gain. When 25 per cent of meat scrap was replaced by a like amount of peanut meal an additional 0.5 lb. of minerals was added to the basal mixture, which contained 1 lb. of minerals per 100 lbs. of feed.

It was found that peanut meal supplemented with minerals could be used to replace 50 per cent of the meat scrap without affecting the growth of the chicks, and that growth was not materially affected when 75 per cent of the meat scrap was replaced. While the addition of 0.5 lb. of minerals for each 25 per cent of meat scrap replaced seemed to be necessary, excessive amounts of minerals appeared to cause slipped tendons. The mortality of chicks fed peanut meal was less than that of chicks fed meat scrap or meat scrap and milk as protein supplements. With the price ratio of meat scrap and peanut meal used in this study, it was found that peanut meal could economically replace 75 per cent of the meat scrap.

**Milk in the feeding of poults,** R. LEARMONTH (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 206–209*).—In work at the Rhode Island Experiment Station it was found that the addition of 30 per cent of dry skimmed milk in a representative mash mixture for chicks does not appear detrimental when fed to poults under 10 weeks of age. "This same 30 per cent increase does appear to increase growth and vitality. Growing poults must have a diet as nourishing as the average dried mash. The value of dry skimmed milk, whether due to its protein, vitamin, mineral, or milk sugar content, has not been determined. Young growing stock requires protein. The greatest protein increase is due to animal protein, as vegetable protein sources also furnish carbohydrate food not so necessary to growing stock. The vegetable protein and carbohydrate grains also are rich in vitamin B. Milk contains animal protein. Animal proteins (meat and fish meal) contain no vitamin B. It appears reasonable, then, to say that the value from dried skim milk was due more to the increase of protein than the increase of vitamin B. Therefore, a mash mixture high in animal protein seems to be indicated for the feeding of growing poults."

## DAIRY FARMING—DAIRYING

**[Dairy cattle experiments at the Idaho Station]** (*Idaho Sta. Bul. 179 (1931), pp. 25, 26, 27, 42, 43*).—Several experiments, two of which are continued (E. S. R., 63, p. 566), are noted.

*Gestation periods and birth weights.*—The average gestation period of 366 calves was 280 days, the males averaging 280.8 and the females 278.9 days. The age of the dam showed very slight influence on the length of gestation. The average birth weight of 206 Holstein calves was 98 lbs. and of 87 Jersey calves, 56 lbs. The weight of the dam had a distinct influence on the weight of the calf at birth. There were indications that younger cows produced smaller calves. Sires varied considerably in the average weight of their calves, and the same appeared to be true for dams.

*Calf losses in the university herd.*—A study of all normal, live calf births and losses incurred up to 6 months of age during the period 1921–1929 showed that of 237 births 8 per cent died before they reached 6 months. Of 156 Holsteins 7.1 per cent died, and of 81 Jerseys 9.9 per cent died before 6 months of age.

*Pea meal compared with linseed oil meal.*—The results of one test indicated that 2 lbs. of pea meal were equal to 1 lb. of linseed meal as a protein supplement to a grain ration for milking cows. Palatability tests showed that most cows readily ate grain mixtures containing 50 per cent of pea meal.

*Dried buttermilk and liquid skim milk for calves.*—A group of Holstein calves was fed whole milk for 2 weeks, gradually changed to skim milk the third week, and from 4 weeks to 120 days of age had a minimum of 12 lbs. of skim milk, 2 lbs. of grain, and all the alfalfa hay they would consume daily. From 4 to 6 months of age they were fed alfalfa hay and grain without milk. A similar group of calves was started in the same manner, changed to dried buttermilk solution the third week, received 12 lbs. of buttermilk solution daily during the fourth and fifth weeks, and during the sixth week changed to a dry grain ration containing one-third dried buttermilk powder and were also fed alfalfa hay. From 4 to 6 months of age they were fed as the above lot. At 4 months of age the lot receiving liquid skim milk was 96.5 per cent normal in height and 115.6 per cent normal in weight, while the other group was 83.6 per cent normal in height and 87.6 per cent normal in weight. At 6 months of age the respective groups were 92.4 and 87.2 per cent normal in height and 113.1 and 89.8 per cent normal in weight. The calves receiving the liquid skim milk were sleeker and thriftier than the other group. The cost of feed per head to 6 months was approximately $1 cheaper in the lot receiving liquid skim milk.

*Hay alone compared to hay and grain for calves* [*at the Caldwell Substation*].—A group of calves was fed whole milk for 2 weeks, gradually changed to skim milk during the third week, and received skim milk to 176 days of age. In addition they received all the alfalfa hay they would consume. A second group was fed in the same manner with the addition of an allowance of 2 lbs. of ground barley per head daily. The average daily gains in the respective groups were 1.69 and 1.75 lbs. per head. The feed cost was about $2.30 higher per head in lot 2 than in lot 1. Milk represented 67 per cent of the feed cost in lot 1 and 61 per cent in lot 2.

*Wintering dairy heifers* [*at the Caldwell Substation*].—A group of heifers fed alfalfa hay alone for 165 days made an average gain of 145 lbs. in weight and 3.8 cm. in height, while a similar group fed alfalfa hay and 2 lbs. of ground barley per day gained an average of 186 lbs. in weight and 3.6 cm. in height. The feed cost averaged $3.49 per month in lot 1 and $4.89 per month in lot 2.

*Irrigated pasture management* [*at the Caldwell Substation*].—The average return per acre for two check lots of old bluegrass sod over a 184-day pasture season was 180 cow days and $91 over other feed costs. The average return per acre for two plats reseeded in the early spring was 206 cow days and $104 over other feed costs. Another old bluegrass pasture was divided into four plats and treated as follows: No treatment, manure, phosphate, and phosphate plus manure. The returns per acre from the respective plats were 138 cow days and $69, 270 cow days and $133, 148 cow days and $70, and 179 cow days and $85.

*Individual grasses and legumes for pasture* [*at the Caldwell Substation*].—Using milking cows to measure results, it was found that various pasture crops made the following returns per acre over a 184-day pasture season; Ladino clover, 170 cow days and $103; second-year white sweetclover, 150 cow days and $91; second-year yellow sweetclover, 128 cow days and $80; first-year white sweetclover, 54 cow days and $40; first-year yellow sweetclover, 77 cow days and $51; Sudan grass, 70 cow days and $46; and rye, 128 cow days and $75.

[Dairy cattle studies in Illinois] (*Illinois Sta. Rpt. 1931, pp. 123–125, 126–133, figs. 4*).—These results are continuations of studies previously noted (E. S. R., 64, p. 870).

*Scientific breeding advanced by inheritance studies.*—The second-generation females in the Bowlker hybrid herd which had been in milk for at least 45 weeks had a milk yield for that period of 6,883 lbs. of milk containing 300.83 lbs. of butter fat. W. W. Yapp found that the difference in the first- and second-generation cows occurred between the thirtieth and forty-fifth week of lactation, indicating a greater persistence in the case of first-generation animals.

*Proteins in dairy feeds do not affect milk color.*—Further studies by Yapp and A. F. Kuhlman showed that, while green feed enriched the color of milk, proteins from different sources fed in concentrates did not affect the color. A marked reduction in the amount of food consumed thinned the color of the milk.

*New facts may help prove dairy sires at younger age.*—A method for studying the developing udders of dairy heifers in order that time may be saved in testing young bulls is being worked out by Yapp. The udders are clipped, covered with olive oil, and sprayed at successive intervals with paraffin of a low melting point. When this material hardens it is removed and used as a mold for plaster of Paris. By keeping a record of developing udders at different stages it is hoped that a method may be worked out for predicting how given types will develop and function.

*Soybeans best cut for hay when pods are well filled.*—In this study by W. B. Nevens a field of soybeans was harvested at five different stages, namely, full blossom, pods forming, pods filled, seeds ripening, and seeds ripe and leaves falling. The yields of thoroughly dry hay per acre were 2,100, 2,900, 4,300, 4,100, and 3,700 lbs. at the respective cuttings. The fourth-cutting hay contained 27.8 per cent of soybean seed by weight, while fifth-cutting hay had 37.4 per cent of seed. The leaves decreased from 65 per cent of the total weight at the first cutting to 55, 41, 31, and 18 per cent, respectively, at successive harvests. Stems decreased from 32 per cent at first cutting to 25 per cent at fifth cutting, while the pods increased from 0 at first cutting to 11, 30, 45, and 58 per cent, respectively, at successive cuttings.

*Practical silage preservatives again prove worth.*—Further studies by Nevens showed that wet straw blown into a 16-ft. silo and applied on roofing paper at the rate of 13 lbs. of dry straw per square foot prevented all but a small amount of spoilage, and this was next to the wall where settling of silage prevented making an air-tight joint. Asphalt and melted paraffin, although preventing spoilage, are not recommended because of expense and labor of application.

*New methods perfected for studying milk yields.*—W. L. Gaines developed two new forms of expressing age-correction factors in milk yields of cows for use in comparing production records. A table was worked out from the average yields (mostly 365 days) of six breeds, classified by age of the cow, giving the factor by which the yield at a given age should be multiplied to convert it to the corresponding yield of 8.39 years or age of maximum yield. A slide rule with a homemade slide bearing the factors at various ages can also be used for making the corrections. It was the most condensed form of expressing the correction factors and was the fastest way for making the computations. A machine was devised to smooth out the irregularities of the actual monthly yields and to get an expression of the trend of the rate of yield with advance in lactation.

**[Experiments with dairy cattle at the Pennsylvania Station]** (*Pennsylvania Sta. Bul. 266 (1931), pp. 19–22, figs. 2*).—The results of several studies are noted.

*The relation of vitamin A to the nutritive value of cottonseed meal,* S. I. Bechdel.—A maximum of 6 lbs. of cottonseed meal per head daily was fed to eight Holstein yearling heifers, and in addition they received dried beet pulp and pearled hominy. After 2 months of feeding two heifers were given 25 cc. of cod-liver oil daily. These heifers never showed signs of malnutrition, even though they consumed from 5 to 6 lbs. of cottonseed meal for 10 months. The other heifers after 6 months' feeding began to show signs of malnutrition (E. S. R., 60, p. 365). Four of these heifers were brought to a normal physical state by feeding cod-liver oil. High-quality alfalfa hay fed to another heifer also returned her to normal. The heifers failed to conceive when fed the basal ration. These results indicated that in heavy cottonseed meal feeding the ration should carry a liberal supply of vitamin A or a closely related dietary factor found in cod-liver oil and alfalfa hay.

*Dry skim milk rations v. blood flour rations for calf raising,* P. S. Williams and S. I. Bechdel. A group of 12 grade Holstein calves fed a ration composed of dry skim milk, yellow corn meal, ground whole oats, linseed meal, wheat bran, blood flour, bone meal, and salt made an average daily gain of 1.106 lbs. per head to 6 months of age, while a similar group of 13 calves fed the blood flour ration developed by the New Jersey Experiment Stations (E. S. R., 61, p. 561) made an average daily gain of 1.044 lbs. per head. The feed cost to 6 months of age was approximately $5.25 per head less in the second group. At 6 months of age the calves fed milk powder were 94.1 per cent normal in height and 80 per cent normal in weight, while the calves fed blood flour were 93.7 per cent normal in height and 75.3 per cent normal in weight. The calves fed milk powder were the thriftier and less subject to digestive disturbances.

*The nutritive value of mechanically dried hay as affected by high temperature in the presence of air,* S. I. Bechdel.—A group of 24 grade Holstein heifers was given an average daily allowance of 11 lbs. of corn silage, 2.9 lbs. of cottonseed meal, 1.2 lbs. of pearled hominy, and 5.2 lbs. of either sun-cured or artificially dried mixed timothy and clover hay for 121 days. The heifers on the mechanically dried hay made an average daily gain of 1.433 lbs., while those on sun-cured hay gained 1.544 lbs. per head daily. The heifers on sun-cured hay grew better, were more thrifty, and had a more alert appearance than those on artificially dried hay. It is believed that the type of drier which used air at a high temperature destroyed the vitamin A content of the hay.

*Oat feed as a partial substitute for mixed hay in the ration of growing heifers,* A. L. Beam.—Over a 126-day period a group of 8 heifers, in which oat feed was substituted for 0.5 of the daily hay ration, gained 1.16 lbs. per head, while a similar group receiving no oat feed gained 1.24 lbs. per head daily. The gain in height at withers was 10.22 and 10.25 cm., respectively.

**Feeding of cattle,** W. M. Ellison (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1930, Eng. ed., pp. 124–126*).—A basal ration composed of a 32 per cent protein grain mixture, sugarcane molasses, steamed bone meal, and salt was fed to two lots of cows for 28 days. In addition one lot received bagasse. During the period the cows on the basal ration consumed 42 lbs. less feed and produced 124.3 lbs. more milk than those receiving bagasse.

A 60-day test was conducted to determine the quantity of feed per pound of milk produced by cows of the Guernsey, Holstein-Friesian, and Brown Swiss breeds. The animals were divided into two groups and in group 1 the respective breeds received 1 lb. of concentrates to each 3, 4, and 3 lbs. of milk produced, while in the second group they received 1 lb. of concentrates for each 2, 3, and 3 lbs. of milk produced. In group 1 the Guernsey cows produced 2.72 lbs., the Holsteins 3.74, and the Brown Swiss 2.92 lbs. of milk per pound of concentrates consumed, while in group 2 the respective breeds produced 1.88, 2.55, and 2.39 lbs. of milk per pound of concentrates consumed.

**[Dairying experiments in Idaho]** (*Idaho Sta. Bul. 179 (1931), p. 28*).—The results of two studies are noted.

*Comparison of salts for butter making.*—Complete chemical and physical analyses of three eastern and two western brands of salt showed no differences that would make the eastern salt preferable for butter making.

*Cooling of milk.*—Water proved to be from 18 to 20 times as efficient as air at the same temperature as a cooling medium for milk. Agitating the milk accelerated the cooling process, but at the end of 3 hours, unstirred milk was approximately as cold as stirred milk.

**[Dairying experiments in Illinois]** (*Illinois Sta. Rpt. 1931, pp. 120–123, 125, 133–138*).—Previous studies (E. S. R., 64, p. 874) are continued.

*Sentiment grows for cream-grading plan in Illinois.*—A survey by C. A. Brown of methods used on Illinois farms indicated that there was practically no difference between the cost of producing cream with an acidity range of from 0.3 to 0.6 per cent and the cost of that having more than 0.6 per cent. The chief factors in producing the better grades of cream were reasonable sanitation, proper cooling and storage, and delivery at least twice a week.

*Butter about same under two cream-cooling systems.*—In a study by P. H. Tracy, H. A. Ruehe, and S. L. Tuckey, it was found that there was little difference in the quality of butter whether the surface cooling or internal tubular cooling was used for the pasteurized cream. There was a slight advantage in favor of the surface cooler in fresh butter, but at the end of 2 weeks and 1, 2, 4, and 6 months butter from cream cooled in the internal tubular cooler scored highest.

*Aging milk overcomes complaints on cream whipping.*—Tracy and R. J. Ramsey found that aging milk before separation appeared desirable, especially in the case of pasteurized milk, and that milk should be held as near 40° F. as possible. Aging raw milk at 40° for 5 minutes gave as good whipping cream as aging at 60° for 15 hours when separation was done at 90°. Pasteurized milk should be aged at 40° for at least 3 hours before separating. The separating temperature was related to the viscosity of the cream as well as its whipping qualities, but the temperature range of from 90 to 100° appeared to give the best results. Cream could be pasteurized at any temperature up to 170° without injury to the whipping qualities, but freezing either the milk or cream injured these qualities. Pasteurizing milk before separating was more apt to affect whipping qualities than pasteurization of the cream itself.

*Findings on size of fat globule in milk confirmed.*—Holstein and Guernsey milks were found to differ in the size of their fat globules in studies by M. H. Campbell of the Vermont Experiment Station and W. W. Yapp. Guernseys produced fat globules from about 15 to 20 per cent larger than Holsteins. With the advance in lactation the size of the fat globules decreased regardless of the breed. First- and second-generation progeny of these breeds produced milk with fat globules of an intermediate size.

*Earlier findings about pasteurization are confirmed.*—J. M. Brannon and M. J. Prucha again found that most of the nonspore-forming organisms were killed by pasteurization. Further work with rats showed no difference in the appearance or behavior of groups fed raw and pasteurized milk, indicating that the process did not lower the food value of the milk.

*Thermophilic organisms spoil milk flavor quickly.*—In milk at the proper temperatures thermophilic organisms may multiply from 40,000 to 100,000,000 in 3 hours. In this study, by Prucha, Brannon, Ruehe, and Tracy, the organism causing potato flavor was found to grow best at temperatures between 70 and 75°.

*Higher food value of evaporated milk being studied.*—In paired feeding tests with rats W. B. Nevens and D. D. Shaw fed milk as the only feed. The amount fed was regulated so that the daily dry-matter intake of the animals of each pair was approximately the same. Rats fed whole milk received the milk only, while those on evaporated milk had doubly-distilled water in addition. The rats fed evaporated milk had smoother and softer coats, better appetites, and lived longer than those fed fresh whole milk. There were some indications that gains in weight and hemoglobin levels were higher in the case of animals fed evaporated milk. Milk evaporated in glass containers gave much the same results as commercial brands. Digestion trials showed that the fat of both whole and evaporated milk was more than 99 per cent digestible, while the sugars were completely digested. The proteins of fresh whole milk were distinctly higher in digestibility than the proteins of evaporated milk.

*Clues found to fault in instant-frozen ice cream.*—Mixes of ice cream were made from the milk of cows fed in the same manner except that the high protein feed in the respective lots consisted of cottonseed meal, linseed meal, and soybean seeds, in this study by Tracy, Ruehe, Tuckey, and Ramsey. Part of each mix was frozen in the continuous freezer and part in the batch freezer. The feeds had no effect upon the whipping of the mixes in either freezer. The continuous-frozen ice creams were smoother and more resistant than the batch-frozen mixes and were gummy only at low overruns. No difference in melting resistance could be traced to the feeds. Excessive amounts of gelatin in continuous-frozen mixes made it harder to obtain the desired overrun, but this overrun was more easily obtained than in the case of the batch freezer. The excess gelatin in the mix was apt to cause sticky ice cream in the continuous freezer. In both the batch and continuous freezers an increase in serum solids made it difficult to obtain the desired overrun. High serum solids caused gumminess in the ice creams frozen instantly. Ice cream containing 10 per cent of fat, 10 per cent of serum solids, 15 per cent of sugar, and 0.3 per cent of gelatin frozen in the continuous freezer had a better body than either of two other ice creams frozen in the batch freezer and containing 12 and 16 per cent of serum solids, respectively.

**[Dairying experiments in Pennsylvania]** (*Pennsylvania Sta. Bul. 266 (1931), pp. 22, 23, 24*).—The results of experiments, some of which have been continued (E. S. R., 64, p. 170), are noted.

*Studies on cream line formation*, F. J. Doan.—Holding milk in bulk for an appreciable time after cooling or after pasteurizing and cooling was detrimental to cream layer formation after subsequent bottling. This was due to the disruption of the fat clumps incident to proper mixing. Mixing cream and milk by inverting the bottle after the cream layer had formed tended to increase the depth of the cream layer which formed again in from 30 to 60 minutes. This increased depth gradually shrank to its former dimension in from 4 to 8 hours. Too vigorous mixing in this manner caused the cream layer to be smaller than the original layer.

*The effect of the homogenizing process on fat dispersion and casein stability of milk and cream*, F. J. Doan and C. H Minster.—Further studies on homogenizing milk containing 0, 4, 7, and 10 per cent of fat at various temperatures and after preheating to various degrees under single- and 2-stage pressures showed that (1) homogenization lowers the surface tension of skim milk except when the product is preheated at temperatures in excess of 120° F., in which case there is an increase; (2) homogenization of milk containing fat increases the surface tension, but rehomogenization of such milk lowers the surface tension; and (3) while high preheating temperatures tend to inhibit or limit fat clumping and to reduce the loss of protein stability upon homogenization, the temperature of processing after such preheating is an important factor controlling the results. High temperatures of preheating did not eliminate fat clumping when the milk contained over 7 per cent of fat, if the mixture was subsequently processed at low temperatures.

*The use of dry skim milk in the manufacture of commercial ice cream*, C. D. Dahle and C. C. Walts.—A forwarding temperature of 160° F. in preparing vacuum roll dry skim milk decreased the freezing time and increased the score of ice cream made from it. In atmospheric roll powder, forewarmed at 110 and 185°, little difference was noted so far as freezing time and quality were concerned, but a forewarming temperature of 145° increased freezing time. Practically no difference was noted in the results obtained with forewarming temperatures in spray powder. As a rule, ice cream mixes containing condensed skim milk scored slightly higher than those containing milk powder.

Spray and vacuum roll powders could furnish approximately 10 per cent of the serum solids in a mix containing 11.7 per cent of serum solids without causing an objectionable milk powder flavor, but between 8 and 9 per cent of atmospheric roll powder serum solids gave a decided milk powder flavor to the ice cream.

*Off-flavor in ice cream*, C. D. Dahle and E. C. Folkers.—An off flavor of a tallowy-fat nature sometimes occurred in strawberry ice cream which was fat free. Every type or brand of commercial strawberries was capable of producing this off flavor, which did not appear consistently. The flavor has occurred when fresh dairy products were used, and also has failed to appear when old, stale dairy products were used. Sterilizing the mix and berries failed to check the off flavor. When spray process milk powder was used no off flavor occurred, but when condensed milk was used the flavor was present.

*Studies with commercial sour cream*, F. J. Doan.—The rigidity of body and viscosity of homogenized, aged, commercial sour cream could be increased by small additions of calcium acetate between pasteurizing and homogenizing. Adding too much of the salt produced "graininess." When fair to good rigidity was obtained without the use of the salt, its addition caused slight coagulation and a "grainy" texture.

**Care of milk utensils on the farm**, R. J. Posson and R. P. Hotis (*U. S. Dept. Agr., Farmers' Bul. 1675* (*1931*), *pp. II+10, figs. 3*).—This is a revision of and supersedes Farmers' Bulletin 1473 (E. S. R., 55, p. 69).

## VETERINARY MEDICINE

**[Work in animal pathology at the Idaho Station]** (*Idaho Sta. Bul. 179* (*1931*), *pp. 20–23, 26, 27*).—The progress of work with grubs of the sheep bot fly in the head of sheep, the details of which are noted on page 273, is reported upon. Minute larvae measuring 2 mm. in length apparently recently deposited were found in the heads of sheep in the locality of the station as early as May 4 and as late as December 13. The distribution of larvae found in 42 heads was, nasal cavity (minute larvae) 183, frontal sinuses 77, maxillary sinuses 19, and dorsal turbinate sinuses 14. The larvae have not been found in other sinuses of the head. Eighty-six per cent of the larvae were killed on the treated side of 14 heads dosed after slaughter, while only 37 per cent of the larvae were killed in 21 sheep treated before being slaughtered.

In a series of treatments for mastitis in the dairy cow ultra-violet ray radiation applied directly to the quarter affected in 14 cows proved to be an efficient means of eliminating clinical symptoms of chronic mastitis such as flaky milk, swelling, and fever. There was, however, apparently no change in the bacterial flora of the quarter following treatment. The ray was applied once or twice daily for 15 minutes held approximately 25 cm. from the affected quarter, a Cooper Hewitt Uviarc poultry treater type R. T., Spec. 100, having been used as the source of light. There was no apparent change in the bacterial flora or leucocyte count of milk during the course in this treatment. The organisms isolated from the cases of chronic mastitis studied were *Streptococcus subacidus* (Holman) 1 case, *Staphylococcus epidermidis* (Bergey et al.) 2 cases, *Micrococcus varians* (Migula) 1 case, and an unidentified species of Streptococcus from 3 cases apparently identical in etiology.

In the treatment of tapeworms it was found that kamala in 1-gm. tablets removed all the worms from 15 of 19 birds treated, iodine vermicide from 9 of 19 birds treated, and C-A capsules from 3 of 19 birds treated. All of the 3 check birds were found infested at autopsy. More satisfactory removal of worms was experienced when the birds were fasted from 15 to 24 hours.

A study of the inheritance of umbilical hernia in two herds of cattle seems to indicate that it is inherited in a simple Mendelian manner and may be due to one allelomorphic chromosome carrying a sex-limited dominant factor for hernia.

The progress of control work with infectious abortion of cattle (E. S. R., 63, p. 573) and with pullorum disease (E. S. R., 63, p. 576) is also noted.

**[Report of work in animal pathology at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 89, 90, 91–94, 105–108, 109–113, figs. 4*).—Referring to the eradication work with infectious abortion of cattle by R. Graham and F. Thorp, jr. (E. S. R., 64, p. 877), it is stated that Illinois now has 46 herds accredited as free from the disease and that during the year 567 herds in 76 counties, including 14,451 cattle, were enrolled in the project.

In reporting upon further work with anemia of swine by T. S. Hamilton, W. E. Carroll, and G. E. Hunt (E. S. R., 64, p. 864), it is pointed out that the surest way thus far discovered for preventing nutritional anemia, which takes a high percentage of mortality in the suckling pig, consists in spreading a solution containing iron and copper salts over the udder of the sow two or three times daily from the date of farrowing on. The solution used in the experiment contained 0.7 oz. of hydrated copper sulfate and 4.5 oz. of hydrated ferric sulfate in each quart of water. The indications are, however, that the copper sulfate may be omitted. The mortality among suckling pigs resulting is estimated at more than 30 per cent of those farrowed. Of 29 pigs that received no metallic salts until they ate solid food, to which 0.1 per cent of crude ferric sulfate was added, 65 per cent developed severe anemia, of which 47 per cent died. None of the nonanemic pigs died. Of 12 pigs that received iron and copper salts from the udders of their dams for 4 weeks and were then offered feed containing 0.1 per cent of ferric sulfate, none became anemic and only 1 died. Of 27 pigs that received small amounts of iron and copper salts or of iron salts alone from the udders, none developed a severe anemia and only 1 died. When 10 pigs were exercised twice daily and 10 others were closely confined, anemia developed in 7 of the exercised and 8 of the confined pigs. When 22 pigs were exposed to sunlight on outside paved lots and 24 pigs were kept indoors, severe anemia developed in 73 and 62 per cent, respectively, and of these pigs 50 and 33 per cent, respectively, died.

In experiments with rats conducted by H. H. Mitchell and Hamilton, purified ferric chloride alone was effective at the end of a week in preventing milk anemia in all 8 pairs experimented with. In marked contrast to the strikingly positive results obtained with iron were the negative results obtained with manganese.

In control work by Graham, Thorp, and W. A. James 8,461 horses belonging to 1,090 farmers in 8 counties were treated for bot fly larvae. A total of 574 bots obtained from treated horses on 47 farms revealed the fact that the throat or chin bot fly and not the nose bot fly is probably the chief offender on Illinois farms. Liquid carbon disulfide used in expelling the bot fly larvae also expelled large numbers of roundworms. The farmers that cooperated in the systematic plan of treating horses reported satisfactory results, having observed an improvement in the animals within 30 days. The relative efficiency of different remedies in expelling bot fly larvae from 75 horses, as judged at autopsy, was as follows: Liquid carbon disulfide 99.33 per cent, mass powder carbon disulfide 91 per cent, and chlorinated carbon tetrachloride 92 per cent. Gasoline, kerosene, chloroform, and ether were of little or no value in expelling the bot fly larvae from the stomach. The effect of 15 different drugs on bot fly larvae in test tubes is reported upon. While chloroform and mass powder carbon disulfide in test tube trials gave results similar to the liquid carbon disulfide, both were less efficient than liquid carbon disulfide. Chloroform, commonly recommended for expelling bot fly larvae, was strikingly inefficient. The experimental testing of different treatments repeatedly emphasized the importance of fasting horses for 24 hours before treatment, as well as the value of withholding feed for at least 5 hours afterwards.

In a comparison made by Graham and V. M. Michael of the intradermal, rapid plate, and field tube tests of 16,080 chickens with the standard agglutination test, the rapid plate test was 88.9 and the field tube test 89.1 per cent efficient, while the intradermal test had an efficiency of 72 per cent.

The preliminary results obtained by Graham and Michael in control work with pullorum disease in incubators suggest that formalin in proper amounts may be effective when released by potassium permanganate, by a spray gun or by cheesecloth. Heat from an electric plate, sodium carbonate and sulfuric acid, atomizers, and a spray pump proved less satisfactory as a method of release. It is pointed out that the effectiveness of fumigation depends upon cleanliness of the incubator, proper humidity (wet bulb reading of 90° F. or higher), the amount of formalin, and the rate of air exchange. In support of the value of formalin as measured in the experiments, many hatcherymen have reported that formalin fumigation has helped to increase chick livability. The results of the fumigation experiments are said to support the following conclusions:

"(1) In a clean, unfumigated incubator *Salmonella pullorum* on contaminated eggshells, cotton swabs, and cotton squares remained viable for 3.5 hours or longer. (2) Formalin released in the incubator by means of potassium permanganate, sulfuric acid and sodium carbonate, a motor spray, an improvised spray on a 50-cc. hypodermic syringe, hot plate, and cheesecloth proved bacteriostatic and germicidal to *S. pullorum* on contaminated eggshells, cotton swabs, and cotton squares. (3) The position of the contaminated eggshells, cotton swabs, or cotton squares influenced the efficiency of formalin. . . . (4) Thirty-five cc. of formalin plus 17.5 gm. of potassium permanganate for each 100 cu. ft. of incubator space (as recommended by the manufacturer) was lethal to *S. pullorum* contaminated eggshells in an average time of 10 minutes and on cotton squares in approximately 14 minutes when the eggshells and cotton were held on the inside of the improvised incubator door. . . . (5) Twenty to 22 cc. of formalin for each 100 cu. ft. of incubator space introduced with a motor spray directly over the fan was germicidal to *S. pullorum* on eggshells in an average time of 6.1 minutes and on cotton swabs in 13.2 minutes . . . (6) Sulfuric acid plus sodium carbonate seemed to be an effective but somewhat inconvenient method for releasing formaldehyde. Thirty-five cc. of formalin released by this method killed *S. pullorum* on eggshells in an average time of 15 minutes and on cotton swabs in 22.5 minutes. (7) A simple, effective release of formaldehyde in the incubator was obtained by saturating cheesecloth with an amount of formalin equal to 20 cc. for each 100 cu. ft.

of incubator space. The formolized cheesecloth was suspended as near to the fan as possible. Twenty cc. of formalin for each 100 cu. ft. of incubator space released by this method was lethal to *S. pullorum* on eggshells in an average time of 11 minutes and on cotton squares in 22.2 minutes. (8) Less than 15 cc. of formalin for each 100 cu. ft. of incubator space, irrespective of the method of release, was bacteriostatic, but not consistently lethal, to *S. pullorum* on eggshells, cotton swabs, and cotton squares, while commercial formalin fumigators and commercial formalin lamps with pastils were unsatisfactory for fumigating the incubator. (9) The immediate germicidal action of formalin on *S. pullorum* on eggshells, cotton swabs, and cotton squares was approximately the same whether the top vents of the incubator were open or closed. (10) When all incubator vents were closed, there was enough formaldehyde remaining in the incubator 48 hours after the release of 20 cc. of formalin for each 100 cu. ft. of incubator space to kill *S. pullorum* on eggshells in 30 minutes and on cotton swabs in 65 minutes, if the contaminated materials were accessible from all sides. With the top vents open, the amount of formalin after 24 hours killed *S. pullorum* on eggshells in an average time of 25 minutes, but did not kill it within 75 minutes on cotton swabs. Evidently enough formaldehyde is retained in the unopened incubator to kill *S. pullorum* for several hours after the release of formalin. The time factor, however, is variable, and *S. pullorum* on cotton swabs or cotton squares is more resistant than eggshell contamination."

Further evidence was obtained by E. Roberts and L. E. Card that heredity plays an important part in the resistance and susceptibility of chickens to pullorum disease (E. S. R., 64, p. 880). After exposure to the disease 82.1 per cent of the chickens from the resistant strain lived, while in the unselected birds 36.4 per cent survived. When the resistant stock appeared once and unselected stock twice in the pedigree, the survival was 49 per cent; when resistant stock appeared once and unselected three times in the pedigree, survival was 34.9 per cent; and when resistant stock appeared twice and unselected twice, the survival was 72.7 per cent. A study of oriental chickens revealed significant differences which can be explained by heredity.

**Diseases of station's animals**, W. M. Ellison and J. Varas Catalá (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1930, Eng. ed., pp. 126, 127, 129–135*).—The greatest damage to dairy cattle was caused by the liver fluke (*Distoma hepaticum*). Intestinal coccidiosis was found in the station calves, it being the first time in Porto Rico that this affection of cattle has been investigated by autopsy and microscopical examination. The tuberculin test has been applied to dairy animals at the station twice yearly during the last 5 or 6 years and no reactors found. In cooperative work with the department of health of the island the tuberculin test was applied to 2,000 head of dairy cattle in various cities and towns, a surprisingly large number of reactors being found. Investigations made of outbreaks of infectious diseases in different parts of the island, including hog cholera, anthrax, blackleg, contagious abortion, and anaplasmosis, are briefly reported upon. Information is given on flatulent colic of the horse, the details being presented in tabular form.

**Artificially induced hypoglycemia and hypocalcemia in the cow and the relationship to parturient paresis or milk fever**, W. E. Petersen, E. A. Hewitt, W. L. Boyd, and W. R. Brown (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 217–227, fig. 1*).—The data presented in this contribution from the Minnesota Experiment Station bring out two important considerations, namely, (1) hypoglycemia is not analogous to milk fever symptoms and (2) the bovine tolerates a much lower blood-sugar level than is reported for other species. The rather prolonged cases of hypoglycemia, going as low as 17 mg. per 100 cc. in one trial, should dispel any question as to low blood sugar being a cause of parturient paresis.

From these experiments it apepars that the beef types react somewhat differently than dairy types, since they gave some evidence of tetany, while only one of the dairy animals showed any symptoms that could be likened to tetany. Before the symptoms of hypocalcemia become too pronounced, the animal may effect a rather rapid spontaneous recovery. If only sufficient sodium citrate is injected to cause a marked staggering gait, spontaneous recovery is effected in a short time. Whether this is effected through an ox'dation of the citrate radical of the calcium citrate and thus freeing the calcium ion, or whether it is due to the release of calcium ions from the body stores, is not known.

**Necrobacillosis of calves (calf diphtheria)**, C. Elder, A. M. Lee, and L. H. Scrivner (*Wyoming Sta. Bul. 183* (*1931*), *pp. 15, figs. 6*).—A practical summary of information on this disease, including its treatment and prevention.

**Bitterweed poisoning in sheep**, W. T. Hardy, V. L. Cory, H. Schmidt, and W. H. Dameron (*Texas Sta. Bul. 433* (*1931*), *pp. 18, figs. 2*).—Following a brief introduction the authors give a description of *Actinea odorata*, known as bitterweed because of its extremely bitter taste, and accounts of its distribution, spread, experimental work, including grazing on it, feeding in the barn, and forced feeding, and symptoms and lesions. This plant, which has been shown to be poisonous to sheep, grows from Kansas south to Mexico and from central Texas west to California, occurring in Texas in greatest abundance in the Edwards Plateau region. It is an annual plant that for many years was confined to basins and low areas but which during the last several years has spread to higher ground so that it now occupies large areas of the previously best grazing land on some ranches. Simultaneously with the spread of the bitterweed heavy losses among sheep have been experienced as a result of the poisoning caused by it.

"The amount of bitterweed an animal must consume to cause symptoms of poisoning varies considerably. In one case as little as 500 gm. of the immature green plant administered in 2 days caused death of the animal, while another animal, consuming 1,100 gm. of the same material in 11 days, remained healthy. Bitterweed poisoning may manifest itself in subacute poisoning when only a small quantity of the plant is consumed or in acute poisoning when larger quantities are taken. Many of the subacute cases will recover if the sheep are removed from bitterweed range when the first symptoms appear and offered supplemented feed, while the acute cases rapidly terminate in death. The symptoms of bitterweed poisoning are such as loss of appetite, cessation of rumination, depression, indications of abdominal pain, bloat, frothing at the mouth, and a green discharge from the nose. Lesions particularly noticeable in bitterweed poisoning are congested areas in the intestinal tract, marked congestion of the lungs, hemorrhages of the external surfaces of the heart, and congestion or hemorrhages of the lymph nodes of the head."

**A new treatment for Oestrus ovis larvae in the head of sheep**, E. M. Gildow and C. W. Hickman (*Jour. Amer. Vet. Med. Assoc., 79* (*1931*), *No. 2, pp. 210–216, figs. 2*).—In work at the Idaho Experiment Station (E. S. R., 63, p. 575) the authors have found that a large portion of 1 cc. of carbon disulfide, which is extremely toxic to the sheep bot fly, can be introduced into the frontal sinuses of sheep through the middle nasal meatus. The lethal dose of carbon disulfide for sheep, when given in equally divided portions in each nostril, is 6 cc. Three cc. of a solution composed of equal parts of carbon disulfide and light mineral oil, introduced into each nostril of sheep, is of decided value in killing the sheep bot fly larvae in the sinuses. The success of this treatment depends entirely upon getting some of the medication into the infested sinuses.

**On the nervous regulation of respiration in the pig, H. H. Dukes and L. H. Schwarte** (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 195–198*).—In preliminary studies on the nervous regulation of respiration in the pig, here reported by the authors, it was found that tightly tying the vagus nerves gave inconsistent results and that no general conclusion can be drawn. "Stimulation of the central end of the vagus nerve gave a variety of results, but complete inhibition of respiration was the prevailing response, especially with the left nerve. Stimulation of the central end of the sciatic nerve also gave many kinds of responses. Negative effects were not uncommon. Ligation of both carotid arteries caused little or no apparent effect on respiration."

**The action of drugs on the cardiovascular mechanism of the pig, L. H. Schwarte and H. H. Dukes** (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 180–194, figs. 10*).—The authors report upon a series of studies of the effect of drugs on the cardiovascular system of the pig, in which it was shown that the average mean blood pressure under local anesthesia was 169 mm. of mercury, under ether anesthesia (insufflation method) 121 mm., under chloroform anesthesia (insufflation method) 111 mm., and under urethane anesthesia (1.5 gm. per kilogram of body weight intraperitoneally) 63 mm.

"Small doses of ethyl alcohol intravenously caused a slight increase in blood pressure and heart acceleration. Large doses caused severe heart depression and a pronounced fall in blood pressure. Arecoline hydrobromide, in doses varying from 1 to 5 mg., caused a decided fall in blood pressure following cardiac depression. Atropine sulfate, in doses of 1 to 3 mg., caused a rise in blood pressure and an acceleration of the heart. With few exceptions the latter effect was preceded by a preliminary cardiac inhibition. Nitroglycerin, in doses ranging from 0.65 to 2 mg., caused a decided fall in blood pressure. In larger doses marked inhibition of the heart was recorded. Pilocarpine hydrochloride, administered in doses varying from 1 to 5 mg., caused a marked fall in blood pressure accompanied by heart depression. Strychnine sulfate, in doses ranging from 2 to 4 mg., caused a definite rise in blood pressure."

**Common animal parasites of horses, F. Thorp, jr., W. A. James, and R. Graham** (*Illinois Sta. Circ. 378 (1931), pp. 20, figs. 20*).—A practical account is given of the more important animal parasites of the horse, the symptoms and lesions caused, treatment, etc.

**Volvulus of small intestine of a two-week-old Belgian foal, J. F. Bullard** (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 247, 248, fig. 1*).—A contribution from the Indiana Experiment Station.

**Brucella infection in a dog, J. F. Planz and I. F. Huddleson** (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 251, 252*).—The authors describe what is thought to be the first reported isolation of the genus Brucella from the canine species.

**Effects of various concentrations of nicotine in tobacco on the growth and development of fowls, J. E. Hunter, D. E. Haley, and H. C. Knandel** (*Pennsylvania Sta. Bul. 266 (1931), p. 8*).—The results obtained in the feeding of *Nicotiana rustica* to chickens are said to have confirmed the earlier conclusions (E. S. R., 64, p. 177; 65, p. 382).

Two hundred day-old chicks were divided into five groups and placed in battery brooders, one group which served as a control receiving no tobacco in the mash, while the remaining four groups received tobacco in the mash ranging from 0.2 to 1.2 per cent. During the first few weeks of their lives each bird received approximately 15,000 roundworm (*Ascaridia lineata*) eggs, incubated and administered just before the worms were ready to hatch out.

It was found 10 weeks later, when the birds were killed and examined, that 78 per cent of those in the control group were infested, 5 per cent of those in the group that received 0.2 per cent of nicotine, and none in the three remaining groups that received 0.4, 0.8, and 1.2 per cent of nicotine, respectively.

**Infectious laryngotracheitis in fowls, R. Graham and F. Thorp, jr.** (*Illinois Sta. Circ. 379 (1931), pp. 16, figs. 9*).—A practical summary of information

**Dissemination of pullorum disease in the incubator, L. D. Bushnell and L. F. Payne** (*Kansas Sta. Tech. Bul. 29 (1931), pp. 60, figs. 10*).—The authors here review the work that has been done on the dissemination of pullorum disease in incubators at the station (E. S. R., 64, p. 880), together with the work conducted elsewhere. Following a brief introduction and discussion of incubators as a source of infection, the susceptible age of chicks to pullorum infection, and an outline of experiments to control the spread of pullorum disease in the incubator, experimental data are presented at length (pp. 15–55). A table of equivalents, dry and liquid measure equivalents, and a method of calculating the amount of fumigant to use are presented in an appendix (pp. 55, 56), followed by a list of the literature cited and an index.

It has been found that formaldehyde fumigation, regardless of whether all ports are closed or left open, will satisfactorily sterilize incubators of the forced-draft type. With a temperature of 99 to 100° F. and a wet bulb reading of approximately 90°, 0.35 cc. formalin liberated by 0.175 gm. of potassium permanganate per cubic foot of space, kills practically all exposed *Salmonella pullorum* organisms within 5 minutes after the formaldehyde has been liberated.

"The germicidal efficiency of formaldehyde gas is greatly influenced by the relative humidity. When the amount of moisture is decreased, the germicidal efficiency of formaldehyde is decreased. In addition, a relative humidity above 50 per cent largely prevents the formation of paraformaldehyde when the incubator is operated at 99 to 100°. Three fumigations of hatching eggs with 0.35 cc. formalin per cubic foot for 1 hour each at weekly intervals, with all ports closed, did not injure the hatchability of the eggs. Continuous fumigation with the pan method of evaporating the formaldehyde was found impractical. The minimum lethal dose of formaldehyde liberated by the hot-plate method was found to be between 60 and 70 cc. formalin per hour in an incubator with 100 cu. ft. of air capacity.

"Experiments dealing with formaldehyde fumigation show that a forced-draft incubator can be sterilized successfully without injuring the hatchability of the eggs. Other experiments, however, reveal that when the chicks are left in the incubator for 36 hours it is not feasible to keep the machine sterilized either by continuous fumigation or too frequent discontinuous fumigation without injuring the hatching chicks. Chicks subjected to one 10-minute exposure of formaldehyde liberated from 0.35 cc. of formalin added to 0.175 gm. potassium permanganate per cubic foot air space with a wet bulb reading of 90° are apparently not injured. Under field conditions, with incubators not so tightly constructed, it is recommended that 0.4 cc. of formalin and 0.2 gm. of potassium permanganate be used per cubic foot of air space.

"Chicks in a Buckeye No. 9 incubator fumigated with formaldehyde liberated by the hot-plate method at the rate of 60 cc. of formalin per hour for 8.5 hours and 55 cc. formalin per hour for 36 hours were severely injured. Likewise, chicks fumigated by means of the formalin-potassium permanganate method with 40 cc. of formalin every 1.5 hours for 36 hours and with 40 cc. of formalin every 3 hours for 36 hours were either killed or were seriously injured. In determining the minimum lethal dose of formaldehyde gas by the fomalin-potassium permanganate method in the Smith incubator, it was found that the dose per volume was approximately the same as for the Buckeye machine.

Relative humidity was found to have a very decided effect upon checking the circulation of chick down. Maintaining a wet bulb reading of 90 to 95° in the incubator resulted in a decided decrease in the number of circulating particles of material as compared to a wet bulb reading of 83° or below.

"From the results obtained by other laboratories the use of formaldehyde fumigation at intervals of 12 hours is effective in reducing the spread of pullorum disease in the incubator. This amount of treatment does not appear to injure the chicks for short periods of exposure. This should be applied at a wet bulb reading of 88 to 90°. Most of the gas escapes in a few minutes and the incubator will be freed of gas in an hour, or the formaldehyde may be removed in a few minutes by ventilation or with ammonia. It is necessary to mix the gas thoroughly with the air of the incubator before it reaches the chicks. When proper precautions are used to remove most of the circulating down and dust from the incubator very satisfactory results will be obtained by fumigation.

"The question of humidity alone is also of great practical importance. The exact mode of operation to obtain the best results will differ in different incubators. The satisfactory temperature for the wet and dry bulb thermometers must be determined by experiment. Evidently a wet bulb reading of between 88 and 90° and a dry reading of 98 to 100° will cover the extreme ranges which should be used during the hatch. High humidity reduces the amount of chick down, dust, and bacteria floating in the air of the machine. The nearer saturated the atmosphere, the smaller the amount of such circulation. The highest relative humidity consistent with the production of the maximum hatch of high quality chicks, without injury to the incubator, should be used during the hatching period or from the nineteenth to twenty-first days of incubation. A wet bulb reading of 80 to 85° gives good results for the remainder of the incubation period."

**A field test for pullorum disease.—Preliminary report,** D. R. Coburn and H. J. Stafseth (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 241–243*).—The authors describe three improvements in the technic of the rapid agglutination test, employing whole blood, which is practicable for a field test for pullorum disease. These include (1) a highly stained (gentian violet) antigen; (2) a white porcelain plate for a contrasting background, thereby eliminating the necessity of artificial lighting; and (3) standardized pipettes for delivering accurate quantities of blood and antigen.

**A stained antigen for the rapid whole blood test for pullorum disease,** J. M. Schaffer, A. D. MacDonald, W. J. Hall, and H. Bunyea (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 236–240*).—The authors describe a new antigen, developed for use in the rapid whole-blood agglutination test for pullorum disease, which is sterile, has good keeping quality, and stains the bacteria a deep violet. "The antigen consists of a suspension of *Salmonella pullorum* in 0.85 per cent sodium chloride solution, adjusted to a turbidity 75 times that of Standard No. 1 of the McFarland scale, killed and preserved by the addition of 1 per cent liquor formaldehydi. U. S. P., and stained by the addition of 0.03 per cent crystal violet. The test may be made by mixing 1 drop of the antigen with a rather heavy blood smear on a glass plate. A more precise method is to measure 0.02 cc. of blood in a wire loop and mix this on a glass plate with 0.05 cc. of the antigen. The stained antigen for the rapid whole blood agglutination test for pullorum disease deserves extended field trial."

**The susceptibility of the guinea fowl to Brucella disease,** M. W. Emmel and I. F. Huddleson (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 228–232*).—This is a contribution from the Alabama Experiment Station reporting upon experimental work in which the feeding of massive doses of two strains of each of the species of the genus Brucella produced an infection in the guinea fowl that was not fatal within 120 days. The lesions resulting were similar to those produced in other species of birds by the same infection. A description is given of what appears to have been a case of natural Brucella infection in two guinea fowls.

**Studies of the fish-borne tapeworm Dibothrium cordiceps Leidy,** B. T. Simms and J. N. Shaw (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 2, pp. 199–205*).—In studies of *D. cordiceps* at the Oregon Experiment Station the authors discovered two new fish hosts for the larval forms of the bothriocephalid tapeworm, the brook trout and the silver salmon. Evidence indicating its pathogenicity for these two fish was obtained. The gull *Larus occidentalis* was established as a new host for the mature parasite.

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations at the Idaho Station]** (*Idaho Sta. Bul. 179 (1931), pp. 14–17*).—The irrigation investigations of the station are briefly summarized, indicating among other things the feasibility of combined drainage and irrigation pumping from the same wells. It appears also that greater yields may be secured from plats of beans irrigated in each row than from plats irrigated in alternate rows.

The land reclamation studies, conducted in cooperation with the U. S. D. A. Bureau of Agricultural Engineering, have shown that the prevention of alkaline soil conditions by means of effective drainage will be more satisfactory than the attempted reclamation of soils after they have become alkaline.

In studies of power machinery it has been found that the use of the combine for the direct harvest of peas is one of the important applications of this machine, both from the saving of peas due to the elimination of shatter, which occurs under other methods, and the possible control of the pea weevil, which is aided by the early removal of the peas from the fields.

Experiments on the operation of farm equipment with electric motors showed that a combination of V-motor drive and flat-driven pulley gave the lowest energy consumption in silo filling.

In studies of poultry houses a comparison of the insulated and uninsulated brooding and laying houses has shown very little difference in the maximum and minimum temperatures reached. The rate of change of temperature, however, is much slower in the insulated house and for that reason tends to produce more desirable living conditions.

**[Agricultural engineering investigations at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 195–220, figs. 5*).—Data for 10 farms are reported by E. W. Lehmann and A. L. Young relating to the amounts of electric energy used in different farm operations and the variation in the total energy used on a farm over a period of time. These show that the lighting circuit load is fairly low in summer and increases to its highest point during the winter months. The consumption by 7 electric ranges varied from 893 kw. hours in July to 171 kw. hours in November. The consumption of 4 refrigerators varied from 440 kw. hours in July to 82 kw. hours in December. The energy consumption of 2 milking machines was fairly constant throughout the year, varying from 50 to 67 kw. hours a month. Five brooders were used during March, April, and May, with the high consumption in April.

Further studies by Lehmann, in cooperation with A. M. Buswell of the Illinois State Water Survey, of sewage disposal for farms and isolated homes

(E. S. R., 64, p. 884), with particular reference to the rate of sludge accumulation over a period of years, showed that there was no uniformity in the rate of sludge accumulation in three experimental septic tanks over a period of three years. There was a decrease in volume of sludge in all three tanks during the third year.

Studies of crank case oils, by R. I. Shawl, when used in a kerosene tractor, indicated that these lubricants are constantly being improved. Studies of crank case oil temperatures showed that these varied from 150 to 160° F. during April and May and from 160 to 175° during June, July, and August. The kind of farm work being done did not make much difference in the temperature of the oil.

In experiments on plowing for corn borer control, Young, in cooperation with R. B. Gray of the U. S. D. A. Bureau of Agricultural Engineering, found that standing stalks were somewhat easier to plow under in machine-picked fields than in hand-picked ones. Also, disked stalks were more easily covered than standing stalks. Where the stalks were not disked ahead of plowing, extra rolling coulters to cut the stalks into shorter pieces promoted better covering. Extremely mellow soil sometimes made it harder to cover trash, particularly when the plows were pulled at low speeds. Knives on stalk shavers must be kept sharp.

In most cases the plows did not cover trash as well when pulled slowly as when pulled faster. Hinged rear trash shields made of heavy sheet metal were effective in a machine-picked field in pushing down into the open furrow stray stalks that escaped from the wires or were lifted by the jointers. In a hand-picked field they clogged badly. In an effort to prevent this clogging, drums that would roll up over bunches of trash were substituted for these shields. Extra coulters, mounted so they would cut the trash somewhere near the center of the furrow slice, helped considerably when plowing under standing stalks. To some extent their use took the place of disking ahead of plowing.

Comparative data on the harvesting of wheat, oats, and soybeans are reported by Young Lehmann, and Shawl, with particular reference to grain losses, showing higher percentage losses for wheat than for oats by both combining and harvesting and threshing. It is apparent, however, that if only a reasonable acreage of oats is combined the losses need be no higher than for other crops. In corn husking the losses from machine picking averaged 12.6 per cent and from hand picking 6.7 per cent. There is every reason to believe that losses in mechanical husking increase rapidly as the corn becomes riper and drier.

In the artificial drying studies with corn, Lehmann, R. H. Reed, W. L. Burlison, and G. H. Dungan found in tests with the Carrier air-conditioning apparatus that drying at 130° cut germination more than drying at 110°, the injury being greatest at high humidity. With a relative humidity of 5 per cent and a drying temperature of 130°, there was no reduction in percentage germination but there was a marked decrease in the vigor of seedlings. In hay-drying tests it was found that crushing of alfalfa and soybean plants increased the rapidity of drying. Disease tests made by B. Koehler showed that while the Diplodia and Penicillium organisms had not been injured 90 per cent of the *Fusarium moniliforme* had been killed by the artificial drying.

Data also are reported on tractor operating costs, terracing methods, the design of stationary spray plants for orchards, and on the planning of hog and poultry shelters.

**[Agricultural engineering investigations at the Pennsylvania Station]** (*Pennsylvania Sta. Bul. 266 (1931), pp. 10–12, figs. 3*).—In studies of accessories for plowing in stony ground, R. U. Blasingame found that the steel moldboards for tractor plows are more economical because cast moldboards break too often. Cast shares are more economical than steel if an efficient spring release hitch is provided. Two bottom tractor plows are more satisfactory than a greater number of bottoms, due to the fact that the 2-bottom plow has more flexibility and less breakage.

In potato production experiments using only mechanical power, the man hours required to grow an acre of potatoes up to harvest were reduced from 48.9 hours when teams were used to 9.59 hours when the general-purpose tractor was used.

Experiments on the adaptation of the general-purpose tractor and the corresponding equipment to corn production indicated that corn can be successfully and economically grown by this procedure. Spring-tooth cultivators have been found to be durable and efficient in land where tight stones occur, but the potato type of weeder is too severe for the corn plant. A more flexible weeder does good work in destroying small weeds and leveling the land to prevent washing of the soil between the rows.

The results of studies of the electrical refrigeration requirements for Pennsylvania dairy farms are reported by J. E. Nicholas.

**Surface water supply of the United States, 1928, III, XII** (*U. S. Geol. Survey, Water-Supply Papers 663* (*1931*), *pp. VIII+245, fig. 1; 673* (*1931*), *pp. VI+172, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1928, No. 663, prepared in cooperation with the States of New York, West Virginia, Ohio, Virginia, Illinois, Tennessee, North Carolina, and Alabama, covers the Ohio River Basin; and No. 673, prepared in cooperation with the States of Idaho, Oregon, Nevada, and Washington, the north Pacific slope drainage basins and the Snake River Basin.

**Surface water supply of the United States, 1929, I, IV, VII, IX** (*U. S. Geol. Survey, Water-Supply Papers 681* (*1931*), *pp. VIII+253, fig. 1; 684* (*1931*), *pp. V+123, fig. 1; 687* (*1931*), *pp. IV+88, fig. 1; 689* (*1931*), *pp. V+105, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1929, No. 681, prepared in cooperation with the States of Maine, New Hampshire, Massachusetts, Connecticut, Vermont, New York, New Jersey, Maryland, and Virginia, covers the north Atlantic slope drainage basins; No. 684, prepared in cooperation with the States of Wisconsin, Illinois, Ohio, New York, and Vermont, the St. Lawrence River Basin; No. 687, prepared in cooperation with the States of Missouri, Arkansas, Kansas, and Texas, the lower Mississippi River Basin; No. 689, prepared in cooperation with the States of Colorado, Utah, Arizona, and Wyoming, the Colorado River Basin.

**Public Roads, [October, 1931]** (*U. S. Dept. Agr., Public Roads, 12* (*1931*), *No. 8, pp. 197–216+*[2], *figs. 16*).—This number of this periodical deals with the current status of Federal-aid road construction as of September 30, 1931, and contains the following articles: Procedures for Testing Soils for the Determination of the Subgrade Soil Constants, by A. M. Wintermyer, E. A. Willis, and R. C. Thoreen (pp. 197–207); Graphical Solution of the Data Furnished by the Hydrometer Method of Analysis, by E. A. Willis, F. A. Robeson, and C. M. Johnston (pp. 208–215); Investigation of Tar Roads in Progress (p. 216); and Traffic Survey of Washington, D. C., Area Begun (p. 216).

**Materials handbook,** G. S. Brady (*New York and London: McGraw-Hill Book Co., 1931, 2. ed., pp. XXIII+588, figs. 13*).—This is the second edition of this handbook. It contains a large amount of information of special interest to engineers.

**Heat transmission**, M. FISHENDEN and A. F. DUFTON ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Bldg. Research, Spec. Rpt. 11 (1929), pp. VI+20, figs. 7*).—Part 1 of this report discusses heat transmission coefficients for various wall materials, and part 2 gives a mathematical discussion of heat transmission laws.

**Photographic flame studies in the gasoline engine**, L. WITHROW and T. A. BOYD (*Indus. and Engin. Chem., 23 (1931), No. 5, pp. 539–547, figs. 17*).—This report was presented before the American Chemical Society at its meeting in Indianapolis, Ind., March 30 to April 3, 1931. An apparatus is described with which, by photographic means, simultaneous flame and pressure studies were made of individual explosions in the gasoline engine. The records obtained show the relation between the rates of flame travel and the resulting rates of pressure rise in knocking and in nonknocking explosions. They indicate that the phenomenon of knock in the gasoline engine, which heretofore has been recognized by its characteristic sound and by the shape of its pressure record, is due to a manifold increase in the rate of inflammation within the latter portion of the charge.

The results also indicate that during the combustion process in the engine there is a relatively narrow combustion zone which moves progressively through the charge, and that, after the burning of the fuel in the combustion zone is over, the products of combustion continue to emit light for some time. The intensity of this afterglow increases as the pressure in the combustion chamber begins to rise rapidly, and during the period of maximum pressure it is most intense in those portions of the products of combustion which were formed in the early part of the explosion before the pressure rose above the compression pressure.

It was found that the extremely high rate of inflammation in that portion of the charge which burns at the instant of knock is apparently due to autoignition occurring within it. The violence of the knock is determined by how large a portion of the total charge is involved in the spontaneous inflammation or the amount of it still remaining to be burned at the instant knock occurs.

The very rapid and often substantially instantaneous inflammation that occurs within the portion of the charge which burns at the instant of knock is accompanied simultaneously by a very rapid rise in cylinder pressure. The magnitude of this pressure rise increases along with the intensity of the knock.

The one effect upon combustion of the presence of lead tetraethyl in the gasoline is to prevent the extremely rapid inflammation of the latter portion of the charge and the accompanying pressure rise. Lead tetraethyl has no effect upon the velocity or the character of the flame prior to the time at which knock would have occurred in its absence.

**Detonation characteristics of some alipathic olefin hydrocarbons**, W. G. LOVELL, J. M. CAMPBELL, and T. A. BOYD (*Indus. and Engin. Chem., 23 (1931), No. 5, pp. 555–558, figs. 2*).—The results of studies are reported which were presented before the American Chemical Society at its meeting in Indianapolis, Ind., March 30 to April 3, 1931. In these studies the relative tendencies to knock in an engine were measured for 25 olefin hydrocarbons, using them in admixture with gasoline. The results are expressed on a molecular basis, using the antiknock effect of aniline as the standard of comparison. On this basis very great differences appear among the knocking properties of these compounds, even among isomers, including those in which the structural difference lies only in the position of the double bond.

Definite relationships between molecular structure and tendency to knock were found for these compounds. With the straight-chain olefins it was observed that in a homologous series the tendency to knock increased with increasing length of the saturated carbon chain, and in an isomeric series the tendency to knock decreased progressively with centralization of the double bond. The tendency to knock was roughly determined by the length of the longest saturated carbon chain. Branched-chain olefins showed a somewhat similar behavior. The tendency to knock decreased upon introduction of a double bond, and the knocking tendency apparently was related not only to the position of the double bond but also to the branched structure of the molecule.

**Synthetic lubricating oils,** F. W. Sullivan, Jr., V. Voorhees, A. W. Neeley, and R. V. Shandland (*Indus. and Engin. Chem., 23 (1931), No. 6, pp. 604–611, figs. 8*).—A description is given of a systematic investigation of lubricating oils made by the polymerization of olefins with aluminum chloride. Various pure olefins up to $C_{16}$, including all of the isomeric $C_4$ and $C_5$ monoölefins and certain cyclic olefins, as well as unsaturated distillates from cracking various materials, were investigated. The temperature coefficient of viscosity of the polymers was found to decrease with increasing molecular weight of normal olefins and to increase with increasing branching of the chains for isomers. The extreme range covered corresponded to a viscosity index of from 140 to less than —300.

A commercial process has been developed for the production of oils by this means, the products of which are said to be well suited for uses where constancy of viscosity with varying temperature or high oxidation stability are required.

**Viscosity-temperature relationship of lubricating oils,** R. G. Sloane and C. Winning (*Indus. and Engin. Chem., 23 (1931), No. 6, pp. 673, 674, fig. 1*).—A proposed method of graphical representation of the viscosity-temperature relationships of lubricating oils is briefly presented and discussed. A comparison of the graphs involved with those of other methods does not show perfect agreement, but on the whole the divergence is said to be surprisingly slight considering the complexity of the relation represented by a comparatively simple equation.

**Oxy-acetylene welding practice,** R. J. Kehl (*Chicago: Amer. Tech. Soc., 1931, pp. [5]+104+[4], pls. 2, figs. 111*).—This is a practical presentation of the modern process of welding, cutting, and lead burning, with special attention given to welding technic for steel, cast iron, aluminum, copper, and brass.

**The fool-proof poultry house** (*Missouri Poultry Sta. Bul. 38 (1931), pp. 35, pls. 2, figs. 21*).—Several poultry houses found adapted to Missouri conditions are described and illustrated, and working drawings and bills of material for their construction are included. They are said to be the results of several years of testing and experimenting with practically all the styles of poultry houses in use in the country to-day.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**[Investigations in agricultural economics and rural sociology at the Illinois Station, 1930–31]** (*Illinois Sta. Rpt. 1931, pp. 8, 9, 10–12, 149–165, 166–173, 174–176, 177–179, 180–193, figs. 10*).—Reports of investigations not previously noted are given as follows:

[*Rural group activities*, H. W. Mumford, R. C. Ross, and D. E. Lindstrom] (pp. 8, 9, 10–12).—The number of local units in county farm bureaus were found to be increasing. In 46 farm bureaus studied, 70 per cent of the local units were organized primarily for educational purposes and 26 per cent for social reasons. Ninety-two per cent of 433 answers to questionnaires indicated beneficial results from local groups of farm people and showed that 49 per cent were organized to secure educational advantages, 35 per cent for social purposes, 25 per cent to improve farm life, and 20 per cent to bring the people of the community closer together. At least one-fourth of the communities of Illinois had local farmers' organizations. A survey of 315 civil divisions in 53 counties of the State showed an average of 12 groups holding meetings. Of the 3,836 groups reported, 32.8 per cent were churches or church groups; 31.8 per cent were groups organized to get, exchange, and transmit information, improve practices, or train talent; 22.2 per cent were social groups; and 13.2 per cent economic groups.

[*Farm organization and management*, H. C. M. Case, M. L. Mosher, et al.] (pp. 149–152).—Additional results in the cooperative farm bureau-farm management service project (E. S. R., 64, p. 888) are given. Tables are included and summarized for 200 farms in Henry, Knox, Peoria, and Stark Counties and the 40 most profitable and the 40 least profitable of these farms, showing the capital investment, receipts and net increases, expenses and net decreases, net returns, and labor and management wage in 1930, and the investment, income, and efficiency factors, by years, for all farms in the project from 1925 to 1930, inclusive. Comparison of the 40 most profitable and the 40 least profitable of the 200 farms showed that the former made $33 more from each $100 worth of feed fed to productive livestock; had larger average yields per acre of 10.3 bu. for corn, 6.3 bu. for oats, 6.2 bu. for winter wheat, 6.4 bu. for barley, 21 bu. for soybeans, and 0.56 ton for hay; and had 6 per cent more of tillage land in corn, more land in soybeans, alfalfa, and clover, and less land in timothy, bluegrass, and winter wheat; and that while power and machinery cost was 49 cts., labor cost 29 cts., and other operating costs 15 cts. per acre less, the production of crops and livestock was $10.30 per acre more. While there was little difference in the amount of livestock, the more profitable farms used only 74 cts. worth more feed per acre.

[*Farm earnings*, R. R. Hudelson, P. E. Johnston, J. Ackerman, and H. C. M. Case] (pp. 153–165).—Analysis of accounts from 2,300 farms in 95 counties showed that farm earnings in 1930 in the 8 types of farming areas of the State varied from earnings of 1.1 per cent to losses of 3.1 per cent, averaging a loss of 0.4 per cent for the State. A table is included summarizing, by 7 areas, the business records obtained from 1,571 farms in 1930.

[*Labor costs*, R. H. Wilcox, H. C. M. Case, and R. G. Trummel] (pp. 166–169).—Charts are included showing for Hancock County, 1913–1922, and for Champaign and Piatt Counties, 1920–1929, the number of hours per acre and the cost per hour of man labor and horse work used in growing an acre of corn. Man labor decreased 12.3 per cent and horse work 5.5 per cent from the period 1913–1917 to the period 1925–1929. The amount of machinery and mechanical power used increased 26 per cent from 1913–1915 to 1927–1929. Cost of man labor increased from 15 to 20 cts. per hour before the World War to 35 to 40 cts. per hour in 1923–1928, and that for horse work tended to fluctuate with the price of home-grown grain.

[*Soybeans*, R. C. Ross] (pp. 169, 170).—Tables are included showing for the years 1928, 1929, and 1930 the acreage, yields, and use or disposition of soybeans on central Illinois farms included in a survey.

[*Combined harvester-threshers*, R. C. Ross] (pp. 172, 173).—Tables are given showing the percentage of combines, individually and jointly owned, on farms of different sizes, and the number of acres harvested on home farms and as custom work with individually and jointly owned machines of different types and sizes.

[*Farm leases*, R. R. Hudelson and H. C. M. Case] (pp. 174–176).—Comparison of 73 average tenant farms and 71 selected tenant farms operated in 1925 under similar conditions showed that the selected farms made 2.23 per cent, or more than $1,000 each, more on investment.

A table is given showing, by items, for the 10 most profitable and the 10 least profitable of 52 selected grain-share cash-lease farms, the total and the tenant's and owner's shares of the capital investment, receipts, expenses, rate earned, and labor and management wage. The more profitable farms showed $2,289 larger net income per year, of which $1,778 went to the operators and $511 to the landlords. Attention is called to the advantages to both owner and tenant of the livestock share lease as compared with the grain share cash lease.

[*Barley growing*, L. F. Rickey and C. L. Stewart] (p. 177).—Reasonable care in the growing and marketing of barley, it was found, would result in larger yields and premiums of 10 to 20 cts. per bushel for barley produced.

[*Financial operation of elevators*, C. L. Stewart, L. J. Norton, and L. F. Rickey] (pp. 177–179).—Data from 174 elevators for years ended between October 1, 1929, and September 30, 1930, in the project (E. S. R., 64, p. 889) showed that during the year the average net worth of stock increased $5, making it 142 per cent of par value; net earnings on par value decreased 6.72 per cent, being 9.17 per cent; and net earnings on net worth decreased 5.14 per cent, being 6.45 per cent. Of the companies, 29.4 per cent showed losses and 29.9 per cent earnings of less than 8 per cent on net worth of stock.

[*Utilization of Chicago grain storage space*, L. J. Norton] (pp. 180, 181).—Data for 1930 in the study noted (E. S. R., 64, p. 889) showed that reported holdings on the first of each month in 1930 varied from 44 per cent of the reported capacity in July to 74 per cent in October, averaging 65 per cent for the year.

[*Soybean prices*, C. L. Stewart and L. F. Rickey] (pp. 181–185).—A table and charts are given showing the index of soybean product values, by months September, 1929, to April, 1931, inclusive, and the imports of soybeans, soybean oil, and soybean cake in 1912–1930.

[*Price studies*, L. J. Norton] (pp. 185, 186).—A table is included showing the average prices of selected Illinois farm products for the period 1921–1929, the year 1930, and the months January to March, 1931.

[*Farm land tenure and transfer*, C. L. Stewart] (pp. 186–188).—In continuation of this study (E. S. R., 64, p. 890), a map is included showing, by counties, the percentage of Illinois farms operated by tenants in 1920, 1925, and 1930. A study of land tax delinquency in 10 counties showed an increase of 81 per cent in the amount of taxes on land sold in 1930 for general taxes over that in 1927. A study of warranty deed transfers of farm land in Champaign County showed an increase in transfers of tracts of less than 20 acres, 40 acres, and 160 acres in the period 1928–1930 over the period 1925–1927. Of the warranty deed transfers in 1928–1930, 24.5 per cent were 80-acre tracts, 19.4 per cent 40-acre tracts, 9.6 per cent 160-acre tracts, and 9 per cent less than 20 acres. Quit-claim deed transfers were less than 37 per cent of all transfers and were found to be decreasing.

[*Illinois hog markets*, L. J. Norton and R. C. Ashby] (pp. 188–191).—In continuation of the study (E. S. R., 64, p. 890), tables are given showing for 1930 the number of days on which the prices of top and good to choice light and medium weight hogs were higher or lower by multiples of 5 cts. per hundredweight at Chicago than at East St. Louis, and the median difference, by months January, 1930, to April, 1931, between the prices of top and good to medium light and medium hogs at the two markets. Some data are also given as regards prices of hogs in the Cincinnati and Indianapolis markets.

[*Milk marketing*, R. W. Bartlett and C. A. Brown] (pp. 191–193).—Tables and a chart are included, with some discussion, showing the membership in 1930 of 10 producers' associations in Illinois and the volume of milk handled by each, and the monthly variations in sales of fluid milk and cream in 1930 in the Chicago, Peoria, and Champaign markets.

**[Investigations in agricultural economics at the Pennsylvania Station, 1930–31]** (*Pennsylvania Sta. Bul. 266 (1931), p. 9*).—A study of fluid milk marketing in the Pittsburgh territory, by F. P. Weaver and F. F. Lininger, showed that the production per farm for approximately 6,000 shippers varied from 139 lbs. in June to 97 lbs. in August, and that for producers not producing primarily for the Pittsburgh fluid milk market varied from 148 lbs. in June to 82 lbs. in December.

Amounts of bruises and undersized potatoes were found by Lininger to be two of the most important factors affecting the wholesale potato price in the Pittsburgh market. Selling the largest potatoes as "bakers" in 15-lb. bags instead of as No. 1 potatoes in 120-lb. bags increased the farmer's price about 50 cts. per bushel. The additional cost was 14.4 cts. per bushel for labor and 12 cts. per bushel for bags.

**Land utilization in a southeastern Ohio county**, J. H. Sitterley, H. R. Moore, and J. I. Falconer (*Ohio Sta. Bul. 485 (1931), pp. 38, pl. 1, figs. 13*).—This bulletin reports the results of a study in Vinton County located in an area where a large percentage of the land is idle and not included in farms and much of the land included in farms is also idle. The topography, surface cover, number and size of holdings, land in and not in farms, houses, school and church buildings, roads, land values, tax delinquency, public revenues and the cost of government, and school expenditures are analyzed and discussed.

**The law of diminishing fertility of the soil, from the point of view of some of the Russian economists of today**, J. W. Boldyreff (*Jour. Farm. Econ., 13 (1931), No. 3, pp. 470–485*).—The general position on the law of diminishing returns taken by Soviet economists is presented and discussed. The article is chiefly a review of the paper Concerning the "Law" of Diminishing Fertility of the Soil, by I͡A A. Miroshkhin,[2] who "may be said to have been the outstanding exponent of the 'orthodox' Soviet economic theory, representing the group of scientists flatly rejecting the 'so-called law of diminishing fertility of the soil.'"

**The "agricultural ladder" in the careers of 610 Ohio farmers**, E. D. Tetreau (*Jour. Land and Pub. Util. Econ., 7 (1931), No. 3, pp. 237–248, fig. 1*).—This is a study of 140 owners and 165 tenants in Madison County and 200 owners and 105 tenants in Union County, Ohio. The counties are very similar geographically, but in 1925 the former had 50.9 per cent of tenancy and the latter 31.3 per cent. Primary attention is given to the relation of the tenant stage to the other stages in attaining unencumbered ownership.

The data indicate that while tenancy is a step to ownership for a considerable percentage of tenants, it may be the top of the "ladder" for a noticeable percentage, and that this percentage has increased for present operators as compared with the two previous generations. The study also indicates that "with geographic and population factors relatively constant, the social-economic environment created by the tenure condition of surrounding farmers has considerable influence upon the behavior of the individual farm operator."

**Scientific organization of agricultural labor in Europe**, M. M. N. Tcherkinsky (*L'Organisation Scientifique du Travail Agricole en Europe.*

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[2] Puti Selsk. Khoz., 1926, Nos. 5, pp. 3–13; 6–7, pp. 3–15.

*Rome: Inst. Internatl. Agr., 1930, pp. [IX]+170).*—This monograph is based upon a study of the existing documentation of the International Institute for the Scientific Organization of Labor at Geneva and visits by the author to Germany, Sweden, Finland, Poland, and Czechoslovakia.

**The agricultural crisis,** Vol. I (*Geneva: League of Nations, Econ. Com., 1931, pp. 322, figs. 3*).—This report of the economic committee of the League of Nations is based chiefly on data presented to the committee and a delegation of the International Institute of Agriculture by experts acquainted with the general problems of agricultural economy at meetings in January, 1930, and January, 1931. Twenty countries were represented at the first meeting and 24 countries and the International Federation of Land Workers at the second meeting. The general characteristics and causes of the crisis, the market conditions in the principal branches of agricultural production (special attention being given to cereals), and the possible remedies for present conditions and the various measures proposed or suggested to deal with the crisis are discussed. While the report is intended to provide a world balance sheet of the agricultural situation, the expert consultations referred more particularly to European agriculture rather than to world agriculture.

Part 2 (pp. 75–319) includes reports of the experts on conditions in their several countries as follows: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Cuba, Czechoslovakia, Denmark, Estonia, Finland, France, Algeria, Germany, Great Britain, Greece, Hungary, India, Irish Free State, Italy, Japan, Latvia, Lithuania, Mexico, Netherlands, Dutch East Indies, New Zealand, Norway, Persia, Poland, Rumania, South Africa, Spain, Sweden, Switzerland, United States, Uruguay, and Yugoslavia.

**[Present trends in Canadian agriculture]** (*Canad. Polit. Sci. Assoc. Papers and Proc., 3 (1931), pp. 123–165*).—Included are the following papers presented at the annual meeting of the Canadian Political Science Association at Ottawa, May 29, 1931: Canada's Foreign Trade in Agricultural Products, by T. W. Grindley (pp. 123–134), discussed by W. M. Drummond (pp. 162–164); The Economic Aspects of the Agricultural Problem, by J. E. Lattimer (pp. 135–144); The Sociological Aspects of the Agricultural Problem, by R. W. Murchie (pp. 145–152); and A Program of Research in Agricultural Economics, by J. F. Booth (pp. 153–161).[3]

**[Outlook charts]** (*U. S. Dept. Agr., Bur. Agr. Econ., 1931, [1], pp. [20], figs. 19; [2], pp. [30], figs. 28; [3], pp. [26], figs. 24; [4], pp. [24], figs. 22; [5], pp. [37], figs. 35*).—These five mimeographed publications include charts with explanations on production, marketing, prices, supply and price relations, etc., of (1) hogs, (2) beef cattle, (3) poultry and eggs, (4) dairy products, and (5) potatoes, sweetpotatoes, and truck crops.

**Trends in purchasing power and cost of production of fruits,** G. N. Motts (*Michigan Sta. Tech. Bul. 120 (1931), pp. 73, figs. 38*).—The purpose of this study was to assemble data on costs of production, prices, and changes in the purchasing power of important fruits and their trends; to present some of the factors involved in the changes; to make comparisons of the changes in the purchasing power with those of butter, beef cattle, hogs, and wheat; and to sketch broadly the changes in the profitableness of growing fruits. The data were obtained from the U. S. Department of Agriculture and State publications, State experiment station bulletins, trade publications, agricultural journals, etc. The production, yields, grades, and cost of production of apples, pears, peaches, plums, cherries, grapes, oranges, and grapefruit are discussed.

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[3] Also noted in Econ. Annal. [Canada], 1 (1931), No. 7, pp. 1–4.

Charts and tables are included and discussed showing the trends in the purchasing power as follows: Apples—New York City 1855–1929, Detroit 1875–1929, Boston 1879–1925, Jonesboro, Ill., 1866–1890 and 1902–1928, Virginia 1867–1927, and New York, Michigan, Virginia, Colorado, Missouri, and Washington after 1910; pears—New York City 1868–1929, Detroit 1880–1929, and New York, Michigan, and California after 1910; peaches—New York City 1857–1929, Detroit 1880–1929, and Georgia, North Carolina, Arkansas, Illinois, California, Michigan, and New York after 1910; plums—New York City 1872–1929 and Detroit 1880–1929; cherries—New York City 1875–1929 and Detroit 1885–1929; grapes—New York City 1868–1929, Detroit 1880–1929, and Pennsylvania, Arkansas, California. New York, and Michigan after 1910; oranges—Florida, in New York City 1889–1929, and California, in New York City 1910–1928; grapefruit—Florida, in New York City 1891–1929, and California, in New York City 1911–1926; butter—New York City 1846–1929, Detroit 1876–1929, and Virginia 1866–1927; beef cattle—New York City 1840–1891, Chicago 1866–1929, Detroit 1876–1929, and Virginia 1867–1927; hogs—New York City and Chicago, 1840–1929 and Virginia 1867–1927; and wheat—New York City 1840–1929, Chicago 1866–1929, and Virginia 1867–1927. The changes in land values, wages, materials, fruit supplies and demand, etc., and their effects on costs and purchasing power are also discussed.

The study showed that the costs of production in terms of goods are at present from 150 to 200 per cent of those in the period 1850–1875 for apples and approximately 200 per cent for peaches. The purchasing power in the Middle Atlantic and North Central States is at present about 125 to 175 per cent of its value in the period 1850–1875 for apples, and about 60 to 75 per cent of the 1880 value for pears. That for peaches is now about 25 to 50 per cent of the 1850–1875 value, that for plums about 60 to 90 per cent of the 1880 value, that for fresh sour cherries about 70 to 80 per cent of the 1880 value, that for grapes about 30 to 50 per cent of the 1880 value, that for Florida oranges in New York City about 60 per cent of the 1889 value, and that for Florida grapefruit in New York City about 60 per cent of the 1891 value.

The increase of cost and decrease of purchasing power as a group has resulted in a narrower unit margin of profit, but it is still sufficiently wide to cause some expansion of fruit growing. Attention is called to the fact that further expansion at present should be made only under exceptionally favorable circumstances, i. e., low growing and marketing costs.

**Manufacturing and marketing dairy products in Virginia, J. L. MAXTON** (*Virginia Sta. Bul. 280* (*1931*), *pp. 35, figs. 7*).—This study was made to determine how dairy products are being made and sold in Virginia and to analyze the factors influencing the efficiency of assembling milk and cream and the making and marketing of dairy products. The data were obtained by personal visits to creameries, condenseries, cheese factories, and receiving stations, usable cost and price records being obtained from 19 creameries, 30 receiving stations, 3 cheese factories, and 2 condenseries. Records were also obtained regarding farm butter making and the disposition of such butter from 155 farmers and country storekeepers. The importance and distribution of the dairy industry in Virginia; farm butter, creamery butter, cheese, and condensed milk production; the quality of creamery butter and cream; butter and oleomargarine consumption in Virginia; foreign trade in dairy products; seasonal price variations of dairy products; the costs of manufacturing and marketing creamery butter and the factors affecting such costs; and the disposition of creamery butter sales are discussed.

The peak of farm butter production in Virginia was in 1909, while the production of creamery butter increased yearly from 1915 to 1929. The costs of assembling butterfat ranged from 2.5 to 6.09 cts. per pound, averaging 4.44 cts. for the 30 receiving stations. The costs per pound of manufacturing and marketing creamery butter averaged 9.69 cts. for creameries making less than 100,000 lbs. of butter per year, 7.87 cts. for those making 100,000 to 199,000 lbs., 7.76 cts. for those making 200,000 to 299,000 lbs.. and 7.14 cts. for those making over 300,000 lbs. In 1929 the average prices paid per 100 lbs. of milk were for creameries $2.14, cheese factories $2.19, and condenseries $2.20 for 4 per cent milk. Of 7,319 cream samples taken, 70 per cent graded No. 1, 22 per cent No. 2, and 8 per cent No. 3. Of 400 butter samples, 30 per cent scored under 89, 41 per cent between 89 and 90, 26 per cent between 90 and 91, and only 3 per cent over 91. Cheese production has been less successful in Virginia than butter making, because of the lack of large volumes of milk from small areas.

The following suggestions are made as to how farmers may increase net returns from milk production: (1) Production of higher quality of milk and cream, (2) insistence on payment on a quality basis, (3) more attention to feeding and handling of milch cows, (4) breeding more cows to freshen during the winter months, (5) elimination of the lowest producers and the addition of a number of high producers to herds, (6) the proper balance between crops grown and livestock kept, and (7) giving strict attention to the return of the manure produced by the herd to the cropped areas on the farm, thus increasing crop yields.

**The supply area of the Chicago livestock market, E. A. Duddy and D. A. Revzan** (*Chicago: Univ. Chicago Press, 1931, pp. XI+100, figs. 33*).—A descriptive analysis is made of the shape, size, and changing dimensions of the supply areas for cattle, calves, hogs, and sheep during the period 1923–1929. The contrasting types of production in different parts of the area and the resulting variation in seasonal movements; the changing character of purchases and shifting location of slaughter and their effects on density and seasonality of shipments from different parts of the area; and price differentials between competing markets and the differential costs of reaching different rival markets from identical supply areas are analyzed and discussed.

**The potential supply area of the Chicago livestock market, E. A. Duddy** (*Jour. Farm Econ., 13 (1931), No. 3, pp. 410–425, figs. 2*).—This study continues that noted above and has for its objective the delimitation of the potential area of the hog supply for the Chicago livestock market under the condition of prices and costs of marketing prevailing during 1923–1929. Among the factors considered in discussing the competition between Chicago and each of the competing markets are average monthly prices for 200- to 250-lb. hogs, differences in terminal marketing charges, freight rates, shrinkage, train service, and time in transit. The theoretical potential supply area of Chicago is compared with the actual area as shown by a study of the data for marketing by county of origin at different markets in 1927. Maps are included showing the potential supply area of Chicago, the zones of indifference (net returns to shippers the same at either market) for Chicago and each of the competing markets, and areas from which each market in 1927 received 75 per cent or over of the rail-haul shipments of hogs.

**Third report on the East Anglian pig recording scheme, A. W. M. Kitchin** (*Cambridge: Cambridge Univ., Anim. Nutrition Research Inst., 1930, pp. 36*).—This report is the third of the series previously noted (E. S. R., 65, p. 584). It analyzes the results obtained for the year ended March 31, 1930.

**International and domestic commodities and the theory of prices, L. B. Zapoleon** (*Quart. Jour. Econ., 45 (1931), No. 3, pp. 409–459, figs. 2*).—"The first three sections of the present discussion treat successively of the concepts of international and domestic commodities, and of the factors which make for uniformity and divergence in the movement of the regional prices. The fourth section attempts a reformulation of the received notions, after a prior classification and analysis of what are broadly termed commodities and prices. The concluding two sections deal briefly with practical and theoretical applications."

[**Family accounts of farm and small town families**, R. C. FREEMAN and R. A. WARDALL] (*Illinois Sta. Rpt. 1931, pp. 278–281, fig. 1*).—Home accounts of 111 families for the year 1930–31 showed average expenditures of $2,190, of which $687 was food, fuel, and shelter furnished by the farm. A table is included showing the distribution of expenditures for the families grouped by realized income. Savings, the automobile, and education were the outstanding indexes of the standard of living. All expenditures, except food which was 19 per cent lower due chiefly to reduced valuations of products furnished by the farm, were in line with those of 1929–30.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**The fundamentals of an agricultural research programme**, T. D. JARVIS (*Sci. Agr., 12 (1931), No. 2, pp. 92–114, pl. 1, figs. 14*).—This is a plea for coordinated effort and correlated findings by different specialists in agricultural research throughout the world and for better interpretation and application of the results to farm problems. It is stated that "there is a tendency for the research scientist to feel that when an isolated problem has been solved to his own satisfaction and that of his colleagues his efforts have been justified. But until these findings have been related to all others which have a bearing on their practical application to the farmers' problems, and until the whole is interpreted in terms easily understood by the farmer and extension service, all agricultural research carried out at public expense remains a public liability. Before such application is possible, however, agricultural research must determine (1) the interrelation of the various environmental factors governing individual types of growth, and (2) the occurrence and distribution of distinct environmental coincidences throughout the agricultural world for purposes of study, comparison, and ultimate economic distribution of crops."

The need for greater facilities for cooperation and exchange of ideas and for a carefully planned basic research program is pointed out. The aims and essential requirements of such a program, with special reference to the Province of Ontario but with possible international application, are indicated. This program begins with the division of the province into agricultural areas according to ecological characteristics and local modifying factors of environment—soil, climate, insect pests and plant diseases, and the like—considered in relation to one another and to the growth of crop plants.

**Baillière's encyclopaedia of scientific agriculture**, edited by H. HUNTER (*London: Baillière, Tindall & Cox, 1931, vols. 1–2, pp. XVI+1361, pls. 29, figs. 43*).—"The underlying idea of this encyclopaedia is the presentation of the results of scientific investigation in their application to the practice of agriculture. With this object in view the main articles dealing with different branches of agriculture have been regarded as a basis around which others dealing with particularized features of research have been disposed." "The main articles have been contributed by recognized authorities in this country and abroad, and embody in a concise form a survey of the present-day position."

The subject matter is largely concerned with British agriculture, but in its broad outlines is applicable to Canada, New Zealand, Australia, and large areas of the United States. Soils, the ordinary arable and pasture crops, improvements in and utilization of crop plants, plant diseases, insect pests, the technic of yield testing, fruit growing, market gardening, greenhouse crops, the storage and marketing of fruits and vegetables, and the scientific basis of foods and feeding receive considerable space. Breeds of livestock and agricultural machinery receive but little attention.

**[Organization and teaching procedure to be followed in evening agricultural schools on marketing]** (*Fed. Bd. Vocat. Ed. Monogs., 1931, Nos. 10, pp. III+16; 11, pp. III+14; 12, pp. III+20; 13, pp. III+19*).—This series of monographs was prepared by J. H. Pearson, in cooperation with the Federal Farm Board as part of a program of education in the principles and practices of cooperative marketing of agricultural products. No. 10 deals with livestock, No. 11 with grain, No. 12 with cream or butter and fluid milk, and No. 13 with cotton. Each includes suggestions to teachers; analysis of the job, including decisions to be made, factors to be considered, and information needed to apply factors; suggestions on teaching procedure for each factor; and a list of general sources of information.

**Analyses of special jobs in quality milk production** (*Fed. Bd. Vocat. Ed. Bul. 154 (1931), pp. VII+17*).—This bulletin was prepared in cooperation with the Bureau of Dairy Industry, U. S. D. A., "to provide teachers of vocational agriculture with current, reliable subject matter organized in teaching form, which will enable them to offer systematic instruction on certain quality milk jobs occurring in dairy enterprises."

**Productive dairying, R. M. Washburn** (*Philadelphia and London: J. B. Lippincott Co., 1931, 4. ed., rev., pp. XXX+438, pl. 1, figs. 133*).—This is a revision of the volume previously noted (E. S. R., 37, p. 894). Job analyses, seasonal projects for teachers, and a section on vitamins have been added.

## FOODS—HUMAN NUTRITION

**The scientific study of the palatability of food, M. D. Sweetman** (*Jour. Home Econ., 23 (1931), No. 2, pp. 161–172*).—This is a critical discussion, with many references to the literature, of present methods of evaluating the palatability, or the sensation-producing qualities of foods. These are classified as of two types: (1) Comparison with scales, imaginary or material, and (2) objective technics and apparatus giving numerical results. In the author's opinion the measurement of preference or desirability is often more difficult than the measurement of the intensity of the qualities which constitute palatability. Three technics for the determination of preferences are discussed—the survey of demand, the determination of the premiums paid for various intensities of a quality, and controlled direct tests of food preferences. It is pointed out that generalizations based upon any of these preference studies should be restricted to the groups whose preferences have been studied, since food preferences depend on custom and the experience of the individual. The importance is emphasized of developing scientific methods for measuring palatability qualities. "Research workers are not alone in their interest in this subject. Teachers, in their attempt to develop standards for appreciation among students and all those in commercial fields who deal with the processing of foods to meet consumer demands, are handicapped by the inaccurate and unrefined methods used in much of the study of palatability."

**Biological value of mixed proteins in omnivorous and vegetarian diets, S. Wan and W. Y. Lee** (*Chinese Jour. Physiol., 5 (1931), No. 2, pp. 163–179*).—

In this continuation of a series of comparative studies of omnivorous and vegeterian diets, the biological values of the proteins of two omnivorous and one vegetarian diet were determined by the Mitchell method as modified by Li (E. S. R., 63, p. 789). The diets included diet 1, or the Sherman diet 13; a new stock diet (diet 102) consisting of whole wheat 46, millet 20, dried lean beef 10, roasted soybeans 10, cod-liver oil 5, yeast 5, and McCollum salt mixture 185 4 parts; and diet 41, one of the two vegetarian diets used throughout the investigations (E. S. R., 62, p. 91). Two series of experiments were run, in the first of which the diets were fed without modification and in the second diluted with cornstarch to bring the level of protein in each case down to 10 per cent.

In the first series diet 1, containing 16.6 per cent of protein, gave a biological value of 72, diet 102, with a protein content of 21.8 per cent, 53, and the vegetarian diet 41, with a protein content of 16 per cent, 66. When fed at a 10 per cent protein level, the biological values became 83, 89, and 74, respectively. When the diets were evaluated on the basis of protein consumption per gram of gain in body weight, the rats on the omnivorous diets 1 and 102 made greater gains than those on the vegetarian diet 41.

These results are thought to demonstrate the superiority of the mixed proteins in omnivorous diets to those in a strictly vegetarian diet.

**Lack of marbling is not serious fault in baby beef** (*Illinois Sta. Rpt. 1931, p. 85*).—Studies by H. H. Mitchell, T. S. Hamilton, S. Bull, and F. C. Olson showed that lack of marbling is not essential for quality in baby beef if there is a good covering of exterior fat on the cut, as the lean may absorb fat from the surrounding tissue during cooking. In addition finished baby beef is naturally tender.

During cooking boneless rib roasts lost approximately 8 per cent in weight, chiefly a loss in water, and a further loss of water in the drippings increased the percentage to 9.4. Of the fat in the original cut 18.4 per cent was lost in the drippings. Drying out of the lean meat and melting out of the fat was evident during cooking. Of the fat melted from the fatty tissue 90 per cent went into the drippings and 10 per cent penetrated into the lean. As a result the fat content of the lean increased 1.5 per cent, equivalent to 14.5 per cent of the original content. The energy value of the lean increased 6 per cent.

**Illinois wheat flours shown to have "two-in-one" use** (*Illinois Sta. Rpt. 1931, pp. 276–278*).—In continuation of the long-time investigation of the baking qualities of flours milled from Illinois soft wheat (E. S. R., 64, p. 894), baking tests and chemical analyses have been made by S. Woodruff on five varieties (Fulcaster, Fulhio, Fultz, Michigan Amber, and Ilred). In addition to the flours milled as previously in the laboratory mills at Manhattan, Kans., flours were milled singly from Fulcaster and Fulhio wheat in a commercial mill at Germantown, Ill., in the usual manner of milling for the trade. The five varieties milled in Kansas yielded two grades of flour designated as "all middlings" and "clear," the former representing about a 60 per cent patent. The wheat milled commercially in Illinois gave a 50 per cent patent grade and an "extra fancy" grade. These corresponded closely to the grades of soft wheat flour milled by the same mills for the ordinary trade.

Analyses of the middlings showed a protein content of 10.2 per cent for the Ilred and from 8 to 9 per cent for the other varieties, as compared with 11.45 per cent for a laboratory-milled single variety hard wheat, 12.67 per cent for a commercial hard wheat, and 7.69 per cent for a commercial brand of cake flour. The patent grades of the commercially milled Fulcaster and

Fulhio flours contained 8.22 and 8.89 per cent and the extra fancy 10.03 and 9.58 per cent protein, respectively. The flours produced from the various Illinois wheat varieties are thus intermediate between the hard and very soft flours. In baking tests, good yeast breads and excellent butter cakes were obtained, thus showing that these flours can be used in place of either a hard bread flour or a fancy cake flour. Scores and volume ratings for breads made from the 1930 flour of all middlings and patent grades and from an all middling hard wheat and a commercial hard wheat flour are tabulated. The total scores did not vary greatly, but the loaves baked from the Illinois flours were in general of smaller volume than those baked from the hard wheat flours.

**The variability of loaf volume in experimental baking, A. E. Treloar and R. K. Larmour** (*Cereal Chem., 8 (1931), No. 2, pp. 95–113, figs. 3*).—This paper reports a statistical study of the variability to be expected in making replicate bakes of the same flour. The study is based upon results obtained by three skilled workers, each baking 50 loaves of bread from the same flour in the same laboratory.

Among the factors affecting loaf volume, as shown by the correlation studies, was the size of pan. Squat-shaped pans produced larger loaves than the specified tall pans of the standard baking procedure. The absence of sugar from the dough resulted in loaves not only of smaller volume but also of greater variability. This variability was reduced and the volume increased by adding 1 cc. of 0.1 per cent $KBrO_3$ solution to the mix. Fluctuations in the temperature of the dough within a range of 28 to 32° C. as it came from the mixing machine had no measurable effect on the volume of the loaves, and there was no variability in volume due to different positions of the loaves in the proofing cabinet.

The loaf volumes of the individual bakers showed systematic fluctuations throughout the day. The average volumes produced were 627.5, 624, and 617.5 cc., respectively. These differences are considered to be sufficiently great to suggest differences in what is termed molding personality. Manual molding of the dough is thought to be an important factor in accounting not only for the differences in loaf volume of breads produced by different bakers but also for differences in loaf volume produced by the same baker.

From a comparison of the differences between the volumes of duplicate loaves in the series and the range of differences in the whole series, the conclusion is drawn that "the average difference between duplicates in a large series of experimental bakes may be expected to be approximately equal to, or a little less than, the standard deviation of the replicated loaf volumes. Thus, at least three times the average difference between duplicates should be taken as the minimum difference to be regarded as significant between volumes of single loaves baked from different flours."

**Effect of moisture content of flour on heat of imbibition developed during the mixing of bread dough, E. Grewe** (*Cereal Chem., 8 (1931), No. 2, pp. 162–165, fig. 1*).—Data are presented showing that the heat of imbibition of bread doughs varies with the moisture content of the flour to such an extent as to be an important factor in bread making. The series of four flours tested varied in moisture content and corresponding temperature of the dough as follows: 13.1 per cent and 30.1° C., 11.5 per cent and 30.8°, 9.9 per cent and 32.1°, and 8.7 per cent and 33.4°, respectively.

**Certain relationships of potash fertilization and varieties of potatoes to table value, M. Whittemore and B. M. Kuschke** (*Rhode Island Sta. Bul. 231 (1931), pp. 16*).—The general technic and the conclusions with respect to the relation between potash fertilization and table value of potatoes, as judged by mealiness of the cooked product, have been noted from another source (E. S. R., 65, p. 91). The bulletin contains in addition a summary of the literature dealing with factors affecting the degree of mealiness in the cooked potato, data on the quantities and forms of potash applied per acre to the plats upon which the potatoes were grown and the yields per acre, and a more detailed discussion of technic and treatment of the experimental data obtained during a 5-year period.

The earlier conclusions that potatoes grown on soil fertilized with high potash are more mealy when tested as boiled, mashed, and baked products than those of the same variety grown on soil of low potash content were confirmed. Contrary to the earlier report in which it was stated that no difference could be detected between the mealiness of potatoes grown on soil fertilized with muriate and with sulfate of potash, the accumulated data over a longer period have shown the muriate to be more effective than the sulfate. The belief that mealiness is increased by increased starch content was apparently disproved by the fact that in 1928 and 1929 the more mealy potatoes contained less starch.

Of the three varieties tested (Green Mountain, Irish Cobbler, and Rural Russet), none scored highest in all desirable qualities (color, flavor, and texture) and the differences in mealiness were insignificant. The Green Mountain scored highest for color and the Rural Russet for mild flavor. When the scores for mealy and very mealy were grouped together, the Irish Cobbler had a very slight advantage, but when the scores for very mealy were considered alone, the Green Mountain ranked first. These ratings were the result of 299 separate scorings recorded in the 3 years' work. "This large number should serve to balance the unusual taste of any one individual."

**The mineral, nitrogen, and fat content of some varieties of mature bean seed and of string beans,** J. S. McHargue and W. R. Roy (*Jour. Nutrition, 3 (1931), No. 5, pp. 479–481*).—Analyses are reported of different varieties of seed and string beans, including the dry mature seeds of White Navy, Black Wax, Brown Pinto, White Great Northern, White Lima, Red and White Kidney, Brown Burpee Stringless, Brown Cut Short, and Brown Kentucky Wonder beans and the immature seeds and edible hulls of green Kentucky Wonder string beans.

In general the data show a high and rather uniform mineral content, with fairly high values for copper, manganese, zinc, and iron. Corresponding values for some of the constituents of the Kentucky Wonder bean at various stages of maturity, including the mature seed, the immature green seed (two-thirds grown), and the edible hulls after the removal of the immature seeds, all calculated to a moisture-free basis, are as follows: Crude ash 4.14, 5.28, and 7.23, copper 0.0011, 0.0010, and 0.0012, manganese 0.0015, 0.0019, and 0.0039, iron 0.0100, 0.0270, and 0.0270, calcium 0.181, 0.274, and 0.671, phosphorus 0.509, 0.744, and 0.553, fat 1.37, 1.41, and 1.29, and nitrogen 3.84, 3.72, and 2.97 per cent, respectively.

**Manganese, copper, and iron content of serving portions of common foods,** M. A. Hodges and W. H. Peterson (*Jour. Amer. Dietet. Assoc., 7 (1931), No. 1, pp. 6–16*).—Using for the most part data reported previously on the iron (E. S. R., 58, p. 191; 59, p. 687), manganese (E. S. R., 58, p. 290; 59, p. 191), and copper (E. S. R., 62, p. 190) content of food materials and on the size of ordinary servings of these foods as given by Rose (E. S. R., 62, p. 686), the authors have calculated the manganese, iron, and copper content of serving portions of 120 different foods and from these values the daily intake of these elements furnished by 16 different menus given by Rose for children, adolescents, men, and women.

"The manganese varies from 0.80 mg. for a child three to four years old to 8.41 mg. for a working man, copper from 0.63 mg. for the young child to 4.81 mg. for the working man, iron from 4.50 for the child to 36.12 mg. for the man. The average daily intake, based on six family menus given by the same author, is as follows: Manganese 2.39 mg., copper 2.26 mg., iron 15.44 mg. Cereals supply the largest proportion of manganese and copper in these diets. Vegetables and cereals are the chief contributors of iron. Fruits are an important source of all three elements. Because of the large quantity consumed, milk furnishes a large proportion of the total intake of iron in some of these diets."

**Iron and copper in the diet** (*Jour. Amer. Med. Assoc., 97 (1931), No. 3, pp. 180, 181*).—An editorial review of recent literature on the subject, particularly the paper by Hodges and Peterson noted above.

**A soluble soybean milk powder and its adaptation to infant feeding,** K. C. CHANG and E. TSO (*Chinese Jour. Physiol., 5 (1931), No. 2, pp. 199–203, figs. 2*).—A spray process is described for the drying of soybean milk (E. S. R., 60, p. 492), and data are given on the composition of the powder and formulas for its use in infant feeding. As tested on one infant for a period of 84 days, the dried soybean milk preparation resulted in growth at a rate superior to the standard weight curves for healthy breast-fed infants. The powder was supplemented with cane sugar, calcium lactate, sodium chloride, water, cod-liver oil, and cabbage water.

**Food for children,** R. S. CARPENTER and H. N. HANN (*U. S. Dept. Agr., Farmers' Bul. 1674 (1931), pp. II+22, figs. 8*).—This publication, which supersedes Farmers' Bulletin 717 (E. S. R., 35, p. 62), contains a discussion of the relation of food to good nutrition in children and of the types of food that meet the specific needs of the body. This is followed by general suggestions for planning the child's meals, with illustrative menus and recipes. On the final page is a brief list of "pointers for parents," emphasizing the more important points to be considered in safeguarding the child's growth and development.

A comparison of this bulletin with the previous edition illustrates the changes which have taken place in the intervening 15 years in theories concerning the proper feeding of children. Less emphasis is now placed upon milk and more upon a carefully chosen variety of foods, although it is stated that "every child should have at least a pint of milk a day" and that "many child-nutrition specialists recommend a quart a day to insure sufficient calcium during the years of rapid growth." Rather more emphasis is placed than formerly upon using a considerable part of the milk allowance in the preparation of a variety of dishes in place of as a beverage, in which form the child's appetite for solid foods may be impaired.

Increased knowledge of vitamin values has led to the recommendation of two servings each day of vegetables in addition to potatoes and two of fruits in place of one each in the former edition. In the discussion of meat and other protein foods, the importance of egg yolk and of liver as valuable sources of iron is brought out. In the earlier edition the statement was made that eggs for children should be poached, soft boiled, or coddled, but the present edition states that there is no reason why children should not have eggs prepared in other ways provided they are cooked slowly at a low temperature so that they will be tender when done.

The chief difference in the suggested menus lies in the much greater variety in the supper or evening meal. Here in place of the former slight variations in toast-milk-custard menus is a variety of foods, including fruits or vegetables, or both. In planning the midday dinner and evening supper for children, the slogan "one menu for all" is followed by careful selection and slight adjustments in the menus for the adults. Greater attention is paid than formerly to variety in meals and to flavor, color, texture, and consistency of foods and food combinations in recognition of the psychological value of variety and attractiveness in helping to influence the desire to eat.

**Agricultural high school dormitories of Mississippi, D. Dickins** (*Mississippi Sta. Bul. 293 (1931), pp. 42, figs. 14*).—This publication reports the results of a general survey of existing conditions with respect to enrollment, housing conditions, finances, student labor, food service, health of pupils, and cultural, social, and religious influences in the dormitories connected with the agricultural high schools in the State. A detailed study of the food consumption habits of the pupils in these dormitories has been noted previously (E. S. R., 66, p. 193).

The study. covering 47 schools, with a total of 3,467 students, 459 teachers, 54 matrons, and 35 other persons living in the school dormitories, should be of particular interest to those in charge of similar dormitories in which the cost of maintenance has to be kept as low as possible. The charges for board in these schoools varied from $9 to $15, with an average of $11.63, per person per month. Of this total, 68 per cent was used for food, 9 for student labor, 6 for salaries of the matrons, 5 for fuel, 5 for lights and water, 4 for wages, and 3 per cent for other expenses. Five hours of practical labor per week were required of all students in connection with the courses in agriculture and home economics. In addition, certain types of work were done by student labor, with pay at varying rates depending upon the task. About 30 per cent of the students had regular employment and a number odd or seasonal jobs.

Farms were maintained in connection with all of the schools and these furnished a part of the food used in the dormitories. Since an analysis of the records of milk, butter, eggs, meat, fish, vegetables, and fruit used in all the boarding departments during one typical school day showed a general shortage in milk, fruit, and vegetables, it is suggested that with better cooperation between the agriculturist and matron in making a food budget to be supplied by the school farm the shortage might be overcome to a great extent. The chief recommendations are for a greater and more varied production of food on the school farm and the employment of trained dietitians for the food service.

**Overweight again reduced by system of sane dieting** (*Illinois Sta. Rpt. 1931, pp. 281, 282*).—The study by H. T. Barto and S. C. Munger of the effect of modified diet and controlled exercise on body weight and physical fitness in overweight college women (E. S. R., 64, p. 895) has been continued by them along the same lines with four additional subjects, "demonstrating again the possibility of safe reduction of weight by the use of simple, well-balanced diets readily available at ordinary eating places, and indicating that it is not necessary to resort to extremes in food selection to get a steady and reasonably rapid loss in weight."

**Individual variation in serum calcium in normal men and women, R. E. Boynton and E. M. Greisheimer** (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 907–913, fig. 1*).—Serum calcium determinations by the Clark-Collip modification of the Kramer-Tisdall method were made in duplicate on 14 women and 11 men three times a week for 4 consecutive weeks and on 3 of the women for a period of 8 weeks. The mean age of the men was 31.91 years and of the women 27.82 years.

The mean serum calcium level for the women was definitely lower than for the men, the values being 10.01 and 10.31 mg. per cubic centimeter, respectively. The women also showed a greater daily variation and a greater absolute range in calcium levels. A study of the values for different periods of the monthly cycle showed a tendency for the serum calcium to be highest in the premenstrual period and lowest in the menstrual period. It is concluded that in women there is a regular cyclic curve of blood calcium level which is not present in men.

**Effect of copper and iron on hemoglobin of the rat in nutritional and hemorrhagic anemias,** C. S. Williamson and P. Ewing (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 1076–1078*).—Comparable groups of rats were rendered anemic (1) by a milk diet and (2) by repeated bleedings, and attempts were made to regenerate hemoglobin in both groups by iron and copper feeding. In the nutritional anemia group, marked improvement was evident as determined spectrophotometrically as early as the twenty-fourth day, while in the other group no increase in hemoglobin was apparent even after 71 days.

**The effect of feeding sorghum and sugar-cane syrups on nutritional anemia,** O. Sheets and E. Frazier (*Jour. Home Econ., 23 (1931), No. 3, pp. 273–280, figs. 3*).—In this continuation of the nutritional anemia studies at the Mississippi Experiment Station (E. S. R., 64, p. 695). sorghum and sugarcane sirups have been found to be effective in the regeneration of hemoglobin in rats rendered anemic on whole milk. A mixture of three varieties of sorghum sirup fed to anemic rats in amounts to furnish 0.5 mg. of iron per rat daily 6 days a week brought about an increase in hemoglobin from 4.8 to 13.2 gm. per 100 cc. of blood in 11 weeks, and a composite sample of sugarcane sirup fed at the same level an increase in the hemoglobin from 5.1 to 11.2 gm. in 16 weeks, while calf's liver fed at the same level of iron caused an increase in hemoglobin from 3 to 13.8 gm. in 12 weeks. A single sample of Crooked Top sorghum sirup fed at a level of 0.4 mg. of iron daily brought about an increase in hemoglobin from 4.7 to 13.6 gm. in 14 weeks.

When fed at a level of 0.25 mg. of iron, the composite sample of sorghum sirup was not quite as effective as the liver fed at the same iron level. It is noted that the rats receiving the mixed sorghum sirup at a level of 0.5 mg. of iron daily received 0.0014 mg. of copper daily, while those receiving sugarcane sirup at the same level of iron intake received 0.0021 mg. of copper daily.

**[Vitamin studies at the Illinois Station]** (*Illinois Sta. Rpt. 1931, pp. 118, 119, 271–275, fig. 1*).—A further application by Mitchell (pp. 118, 119) of the paired feeding method (E. S. R., 63, p. 393) to the quantitative distribution of vitamins B and G (E. S. R., 64, p. 895) has led to the conclusion that the method is a promising one for the determination of relative vitamin concentrations in different foods and feeds. This involves determining experimentally the smallest percentage of the material being tested in a ration adequate with respect to all other factors than the vitamin in question that is not improved by an addition of a small amount of a concentrate of the vitamin. In comparisons by this method of the vitamin B content of corn and wheat, the minimum or critical percentages were 40 and 45 for corn and between 50 and 55 for wheat, thus demonstrating that wheat is slightly inferior to corn as a source of vitamin B. These values were obtained when the basal ration contained 18 per cent of casein, but it was found that when the ration contained 30 per cent of casein only 30 or possibly 25 per cent of corn was required.

A further study by C. R. Meyer and J. M. Smith (p. 271) of tikitiki as a source of vitamin B has confirmed the suggestion made in the previous report that it contains appreciable amounts of vitamin G, although it is not a potent source of this vitamin. Autoclaved tikitiki extract fed to rats at the rate of 24 drops daily supported growth but not at a normal rate. Nearly as good results were secured on 12 drops, but definitely poorer growth on 6 drops daily.

Autoclaved rice polishings fed as 50 per cent of the diet were found to contain enough vitamin G to support growth at a nearly normal rate.

Earlier studies of Croll and Mendel (E. S. R., 54, p. 793) on the distribution of the vitamin B complex in the structural parts of the corn kernel have been repeated by Meyer and Smith (pp. 271–273) with the newer technic for differentiating vitamin B from G. As had previously been found true for the vitamin B complex, vitamin B ($B_1$) was found to be concentrated almost entirely in the germ and thus lost to human consumption.

A further study by M. Plant and Meyer (p. 273) of the value of yellow corn germs as the sole source of vitamins B and G for lactation in rats has shown that on the three levels at which the material was fed (40, 65, and 80 per cent) the growth of the mother rats was below normal. In the animals receiving diets containing 65 and 80 per cent of corn germs, growth was accelerated by adding brewers' yeast or tikitiki extract to the diet. Only a small proportion of the litters of rats on the unsupplemented diet reached the age of 3 weeks, and these were subnormal in weight. When the diet containing 40 per cent of corn germ was supplemented with 15 per cent of autoclaved yeast there was a slight increase in the average weight of the litters at weaning, and when the diet was supplemented with 10 gm. of kidney daily, litters of normal weight were produced. When the diets containing 65 and 80 per cent of corn germs were supplemented with brewers' yeast or tikitiki, there was no improvement in the young. The possibility is suggested that the protein supplied by 18 per cent of casein and corn germs is a limiting factor in lactation.

The relative concentration of vitamin B and vitamin G in oats as reported previously has been confirmed by Meyer and Smith (pp. 274, 275) in further studies. A comparison of several basal diets differing only in the source of energy has led to the conclusion that "it is of the utmost importance to use a uniform source of carbohydrate or carbohydrate and fat in the basal diet in comparative vitamin B studies. The most sensitive diet for the determination of the antineuritic vitamin was found to be the glucose-Crisco diet." The paired feeding method of Mitchell, noted above, has been found adaptable to the vitamin B testing of oats, and with this method it has been determined that about 35 per cent of oats is necessary for normal growth when serving as the sole source of vitamin B.

Various foods have been tested by Meyer and Smith (p. 275) as supplementary sources of vitamin G with a 50 per cent oats diet during pregnancy and lactation in rats. Lactation was unsuccessful with 10 gm. of egg white or 25 gm. of apple as a daily supplement, nearly normal with 10 and 15 gm. of lean beef, successful with 5 and 10 gm. of egg yolk, 30 and 40 cc. of fresh whole milk, and 40 gm. of head lettuce, and very successful with 10 gm. of beef kidney. Growth experiments to determine the vitamin B and G content of these foods have led to the conclusion that beef kidney, lettuce, egg white, and egg yolk are excellent sources of vitamin B and autoclaved beef kidney and lettuce good sources of vitamin G as well. Apples were found to be a poor source of both vitamins, and yeast ash was entirely ineffective as a source of vitamin G.

**Vitamin studies.—XVIII, The biological assay of food materials for vitamin A as influenced by yeast from various sources, H. E. Honeywell, R. A. Dutcher, and J. O. Ely** (*Jour. Nutrition, 3 (1931), No. 5, pp. 491–498, figs. 3*).—This continuation of the series of papers noted previously (E. S. R., 63, p. 396) is the complete report of observations noted from a progress report (E. S. R., 62, p. 397), leading to the conclusion that quantitative results in vitamin A assays will depend upon the nature of the yeast used as the source of the vitamin B complex. The evidence presented suggests the possibility that yeasts from different sources not only differ in their vitamin B content but that some contain traces of vitamin A, while others do not. Both of these variations are thought to affect the accuracy of vitamin A tests. The data presented also suggest the possibility that what has been known as vitamin A may consist of two factors, one necessary for preserving the normality of epithelial tissues and the other possessing the growth-stimulating properties usually ascribed to vitamin A. One of the yeasts studied possessed antiophthalmic properties but poor growth-promoting properties, while the other stimulated growth but possessed no power to prevent the development of the eye disease.

**Loss of vitamin A during the baking of thin butter cookies,** H. T. Parsons, I. Stevenson, I. Mullen, and C. Horn (*Jour. Home Econ., 23 (1931), No. 4, pp. 366–372, fig. 1*).—This is the complete report of a study noted from a preliminary report (E. S. R., 63, p. 92). The extent of loss of vitamin A in the baking of thin butter cookies to a light brown color (10 minutes in an oven at 320° F.) and subsequent storage for not more than 5 days is estimated to be from one-fourth to one-fifth the original vitamin A content of the dough.

**Utilization of vitamin A in the presence of mineral oil,** R. A. Dutcher, N. B. Guerrant, and W. I. Zimmerman (*Pennsylvania Sta. Bul. 266 (1931), pp. 8, 9*).—It is noted briefly that the utilization of vitamin A from a cod-liver oil-mineral oil mixture is satisfactory, although its utilization from a butterfat-mineral oil mixture is unsatisfactory (E. S. R., 58, p. 88). It is suggested that the difference may be due to the greater solubility in mineral oil of carotene, the precursor of vitamin A, than of vitamin A itself as present in cod-liver oil.

**Viosterol and cod liver oil: Comparative observations,** E. O. Prather, jr., M. Nelson, and A. R. Bliss, jr. (*Amer. Jour. Diseases Children, 42 (1931), No. 1, pp. 52–56*).—Attention is called to the growing belief among some pediatricians and physicians that viosterol is a concentrated substitute for cod-liver oil, without regard to the fact that viosterol furnishes only vitamin D while cod-liver oil furnishes both vitamins A and D. To demonstrate the difference in effects produced by the two materials, three groups of rats were fed a diet adequate in proteins, inorganic salts, calories, and vitamin B. One group received this diet without supplement, while each of the rats in the other two groups received ½ drop daily of viosterol or cod-liver oil.

In the animals on the basal diet alone or supplemented with viosterol, the well-known symptoms of vitamin A deficiency developed, particularly infection in the upper respiratory tract and intestines, while the rats receiving cod-liver oil showed no abnormality. "Since 'colds,' malnutrition, and intestinal inadequacies are more frequent in children than rickets, this study emphatically suggests that the apparently widespread substitution of viosterol for cod-liver oil in the diet of the child is not logical, and may result in an appreciable decrease of the child's strength and resistance to infections."

**The excretion of vitamin B by artificially fed infants,** A. W. Gulick and A. L. Daniels (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 861, 862*).—This is a preliminary report of a vitamin B balance experiment conducted on a group of 11 infants receiving a diet of cow's milk, a carbohydrate modifier free from vitamin B, orange juice, and cod-liver oil, with the addition in a few cases of a vitamin B-containing extract. The amounts of milk fed were comparable in some instances with the amounts usually recommended by pediatricians, 1.5 oz. per pound per day, but were somewhat higher in the case of infants younger than 3 months. The vitamin B values of the food and excreta were determined by the usual feeding method, except that the experimental period was only 8 days in length. The unit of vitamin B was defined as the amount necessary to cause a young depleted rat weighing about 60 gm. to gain from 1 to 2 gm. a day during this short period. As thus determined, the urine was found to contain from 13 to 40 units of vitamin B. The retention of vitamin B was fairly consistent at 8.4 units per kilogram of body weight. The addition of 12 units of vitamin B to the formulas in the form of 30 cc. of wheat germ extract brought about no significant change in the amount of vitamin retained.

It is concluded that "in general the amounts of milk necessary to furnish vitamin B for growth and to allow for losses through lack of absorption in the infants studied were found to be comparable with the amounts commonly prescribed for artificially fed infants, namely, 1.5 oz. per pound of body weight. With the younger baby slightly larger amounts of milk would seem desirable. The data suggest that the vitamin B requirement per unit of body weight is higher in early infancy and decreases with age."

**[Vitamin C in Idaho potatoes]** (*Idaho Sta. Bul. 179* (*1931*), *pp. 31, 32*).—In this progress report a summary table is given of data supporting the conclusion noted in the previous report (E. S. R., 63, p. 594) that the young immature but growing potato (Idaho Russet Burbank variety) "has better antiscorbutic properties than does the mature tuber or the one which has been in storage during the winter months." In conducting the guinea pig tests, the Sherman diet and technic were used with the exception that the diet was modified to include 1 per cent of cod-liver oil and the test period was reduced to 8 weeks. The potatoes were prepared by cooking with the skins on for 30 minutes in distilled water, after which the skins were removed and the potatoes put through a ricer, mixed thoroughly, and weighed out and fed promptly. All of the animals receiving as much as 4 gm. daily lived through the experimental period except those receiving potatoes which had been stored all winter. The average survival period of 5 animals receiving 6 gm. daily of the stored potatoes was 52 days as compared with 26 days for the controls in the same group. None of the animals receiving 8 gm. of the stored potatoes died during the 8 weeks. The minimum amount of the summer potatoes fed, 4 gm., did not give complete protection against scurvy. The average length of time before the appearance of symptoms in 10 animals receiving this dose was 53 days as compared with 14 days on the basal diet alone.

It is noted that a few tests carried on with summer potatoes cooked without the skins indicated very little difference in antiscorbutic potency due to cooking without the skins.

**A metabolism room for the study of rats under controlled conditions of light and temperature,** L. G. Wesson (*Jour. Nutrition, 3* (*1931*), *No. 5, pp. 499–501*).—A brief description is given of a small metabolism room in which rats may be kept in darkness under controlled temperature and ventilation conditions. "By providing a room of this character in which not only the variations of temperature and light from day to day and from season to season, but also the important diurnal variations, are avoided, it is believed that certain metabolic and vitamin standardizations can be made which would otherwise be impossible, and seasonal variations can be better traced to the real underlying causes."

**The metabolic rate and respiratory quotients of rats following the ingestion of dextrin and during fasting,** L. G. Wesson (*Jour. Nutrition, 3* (*1931*), *No. 5, pp. 503–518, figs. 2*).—Adult male rats were kept in the metabolism room described in the paper noted above at a temperature of 28° C. for 3 days or more to accustom them to their environmental conditions and were then fasted for from 18 to 24 hours, after which a test meal of dextrin was given and metabolism determinations were conducted at varying intervals following the test meal.

By the fourteenth hour after the test meal, the metabolic rate, which was at first high (900 calories per square meter per 24 hours), had fallen to about 710 calories and remained at about this level to the forty-fourth hour, the average being 718 calories per square meter per 24 hours.

The hourly averages of the respiratory quotients after the dextrin feeding decreased rapidly to 0.744 at the sixteenth hour and more slowly, with slight diurnal variations, to 0.738 at the forty-third hour. The average respiratory quotient for the thirty-eighth to forty-fourth hour, inclusive. was 0.733 uncorrected, or 0.722 corrected for protein metabolism.

## MISCELLANEOUS

**Work and progress of the [Idaho] Agricultural Experiment Station for the year ending December 31, 1930,** E. J. IDDINGS (*Idaho Sta. Bul. 179 (1931), pp. 47*).—This contains the organization list, a report of the director, and financial statements for the Federal funds for the fiscal year ended June 30, 1930, and for the remaining funds for the fiscal year ended December 31, 1930. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

**A year's progress in solving farm problems of Illinois: [Forty-fourth Annual Report of Illinois Station, 1931],** compiled and edited by F. J. KEILHOLZ (*Illinois Sta. Rpt. 1931, pp. 304, figs. 66*).—This contains the organization list, a summary of the work, and a financial statement for the fiscal year ended June 30, 1931. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

**Forty-fourth Annual Report of the Pennsylvania Agricultural Experiment Station, [1931],** [R. L. WATTS ET AL.] (*Pennsylvania Sta. Bul. 266 (1931), pp. 40, figs. 15*).—This bulletin discusses briefly the work of the station for the fiscal year ended June 30, 1931, including a financial statement for this period. The experimental work recorded and not previously noted is for the most part abstracted elsewhere in this issue. The results of a pasture fertilizer experiment by F. D. Gardner (pp. 13, 14) and meteorological data for 1930, reported by C. O. Cromer (pp. 38, 39), are also noted.

**Insular experiment station** (*Porto Rico Commr. Agr. and Labor Rpt. 1929, Eng. ed., pp. 690–706*).—The experimental work noted in this report for 1929 is for the most part abstracted elsewhere in this issue.

**[Annual Report of Porto Rico Insular Station, 1930],** R. FERNÁNDEZ GARCÍA ET AL. (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt. 1930, Eng. ed., pp. 149, pls. 8, figs. 7; abs. in Porto Rico Commr. Agr. and Labor Rpt. 1930, Spanish ed., pp. 148–187, figs. 6*).—This contains the organization list and a report of the director for the fiscal year ended June 30, 1930, the experimental features of which are for the most part abstracted elsewhere in this issue.

# NOTES

**California University and Station.**—The staff of the Giannini Foundation has been augmented by the appointment of Dr. Murray Reed Benedict of Harvard University as agricultural economist and Dr. Howard James Stover, instructor in prices and statistics in Cornell University, as assistant agricultural economist. Dr. Benedict will also serve as professor of agricultural economics and agricultural economist in the station, and Dr. Stover as assistant agricultural economist in the station.

Dr. Frederick A. Brooks has been appointed associate in agricultural engineering with headquarters at Davis to conduct research along mechanical engineering lines relating to agriculture. Dr. Alden S. Crafts has been appointed assistant botanist in the station to study the problem of weed control. To cooperate with the staff of the recently established Pacific Coast Apiculture Laboratory of the U. S. D. A. Bureau of Entomology at Davis, Dr. John E. Eckert has been appointed assistant professor of apiculture in the university. Dr. Harvey E. Thomas, assistant professor of plant pathology at Cornell University, has been appointed associate plant pathologist in the station to undertake studies of fruit tree diseases, with special reference to pear blight, for which the California Legislature has made a special appropriation of $15,000 for the current biennium.

Dr. Joseph Kittredge, jr., senior silviculturist in the Lake States Forest Experiment Station, has been appointed professor of forestry and forest ecologist in the station, effective January 1. In cooperation with other divisions of the College of Agriculture, the general field of forest influences will be examined, including the effect produced by forest and chaparral on the run-off of water, soil erosion, and the climatic relationships.

**Kansas Station.**—Experimental fields for which appropriations were made by the last legislature have been established in south-central Kansas on three of the major soil types and will be used primarily to study problems relating to the production of the staple crops of the region. C. E. Crews has been appointed assistant professor of agronomy in charge of these fields, and has been succeeded as foreman of the agronomy farm by F. G. Ackerman.

Similar experimental fields to be established in northeastern Kansas will include a bearing apple orchard, a field that will be planted to an apple orchard, a small field for the study of the problems of the small fruit industry, a field for experimental work with potatoes, and a general crop field on the principal glacial soil of the region. T. Russell Reitz, now county agent of Wyandotte County, has been appointed assistant professor of horticulture in charge of these fields.

**Minnesota Station.**—The office of the station has recently been enlarged to include a room for calculating equipment. Dr. F. R. Immer has been employed on a part-time basis as statistical adviser to the station, with the expectation that he will assist in organizing the investigations and laying out procedure that will permit much more careful statistical analysis than has been heretofore possible. A statistician will be employed also to give service to various research divisions and to make compilations and tabulations and assist with the statistical analysis of data arising in station work.

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# EXPERIMENT STATION RECORD

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## EDITORIAL

### ECONOMIC AND SOCIOLOGICAL RESEARCH IN THE AGRICULTURAL EXPERIMENT STATIONS

Research in agricultural economics, rural sociology, and home economics has received nearly half of the Purnell funds thus far expended. Of the $12,480,000 available under the Purnell Act from its enactment to June 30, 1931, $3,925,674 was utilized in agricultural economics and $486,743 in rural sociology projects. Home economics was allotted $1,500,345, or about 12 per cent of the Purnell funds, and the remainder was divided among at least 15 other recognized fields of agricultural science. Collectively, agricultural economics, rural sociology, and home economics have received a total of $5,912,762, or more than 47 per cent of the aggregate available from Purnell sources.

These data, derived from material compiled for publication in the forthcoming annual report of the Office of Experiment Stations on the work and expenditures of the agricultural experiment stations, attest the prominence which these comparatively new lines of inquiry have come to assume in the station program. They demonstrate that the stimulus given to station research by the Purnell legislation has been availed of generally to supplement the production studies by economic and sociological investigations. They indicate further that despite the difficulties experienced in expanding the organization of these fields so rapidly the emphasis laid upon this work has been consistent and unmistakable.

Comparison of the number of active projects somewhat unexpectedly reveals a decrease in each subject. This decrease is slight, however, from 338 to 331 in agricultural economics and 41 to 36 in rural sociology, and for neither subject should it be deemed significant of a decline of either interest or activity. The completion of certain studies and the consolidation of others into larger undertakings is a more logical explanation. Of much greater importance is the fact that in agricultural economics the allotments from Purnell funds rose from $780,173 in 1930 to $812,956 in 1931 and that similar increases occurred in the State funds assigned to these projects. In rural sociology the Purnell allotments decreased from $91,000 to $85,340, but even these lower figures represented a slight increase in the amount per project.

Not only have the allotments of funds for such purposes been substantial, but the report notes distinct advancement in such matters as the preparation of specialists to carry on the work, the methods employed, and the scope of the attack upon the larger problems. Thus, in agricultural economics the research staff increased from 250 in 1930 to 280 in 1931, the number holding the Ph. D. degree or its equivalent from 60 to 77, and the number holding master's degrees from 126 to 134. The personnel had also become more experienced, and this was undoubtedly a factor contributing to the revision and restatement of many projects and the substitution of more effective methods of attack for those originally adopted. Specifically, noteworthy progress is reported in sampling and interpretation and in the improvement of statistical methods in general.

In rural sociology, likewise, the improvement in quality of research has been unmistakable. Here the tendency has been to substitute for the more generalized type of inquiry or survey earlier employed a more precise and specialized attack upon specific problems. There has also been a trend from contemporary or cross-section to historical studies. In point of intensity, the studies of this group have evolved from the community to the locality and, more recently, to the individual family. More study is being devoted to standards of living as reflected in farm family incomes and expenditures, and of late considerable interest has developed among sociological research workers in analyses of farm families taking the individual members composing the family as the unit of study. As soon as satisfactory methods of research can be developed, this more intensive type of study will, doubtless, become more general.

The world-wide depression has emphasized the need for more comprehensive programs of research, whether carried on severally or jointly by the State experiment stations and the Federal Department of Agriculture. This need is especially marked in the fields of agricultural economics and rural sociology, where there is an increasing appreciation of the fact that in addition to their local and individual significance, problems are often regional, national, and even international in scope. This realization has helped to bring about the consolidation of many projects into larger undertakings of greater economic and social significance and the formulation of others along broad cooperative lines. A significant development in such cooperative effort during the year has been the starting of an extensive three-year study of interrelated farm and home, educational, and rural life problems of the Southern Appalachian Highlands. This study is participated in and financed by five experiment stations of the area, the Bureaus of Agricultural Economics and Home Economics and the Forest Service of the U. S. Department of Agriculture and the Office of Education of the Interior Department, as well as a number of nongovernmental educational and religious organizations. It is expected that ultimately this study will supply a store of dependable data which should prove extremely useful as a basis for readjustments in the economic and social conditions of the rural people of the region.

Another recent development is the distinct trend toward the correlation of natural science researches with those which are economic and sociological. This is encouraging, as Director W. C. Coffey of the Minnesota Station concluded in his recent address at the New Orleans meeting of the American Association for the Advancement of Science. As chairman of Section O, Agriculture, Director Coffey, speaking on the subject of The Relationship of the Natural Sciences and the Social Sciences in Agricultural Education in the United States, spoke in part as follows: "On the one hand our agriculture needs a science to make us intelligent and efficient in our processes of production; on the other hand, it needs a science to make us intelligent and efficient in distributing our production and adjusting it to the logical demand for it. If the amount of production greatly exceeds the demand for it, interest in intelligent and efficient production and the science underlying it is sure to sag. If production should be unintelligent and inefficient, no system of distributing and adjusting production to demand could bring prosperity and better living to rural people. In these very simple terms, the essential relationship between the natural and social sciences in agriculture may be expressed."

Dr. B. Youngblood of the Office of Experiment Stations has expressed a similar view in an address before the American Farm Economic Association entitled The Integration of Research and Extension for Progressive Agricultural Adjustments. "Through correlation and integration," he declared, "the customary lag between the discovery of important truths and their general adoption in practice will be materially reduced and time and money saved. Projects and programs will be strengthened and made more effectual. Both the forces of nature and of human society will be made to work for, rather than contrary to, the interests of the farmer and his family. The growing efficiencies and capacities of rural people will be diverted from the production of unprofitable surpluses and all that they imply to the realization of remunerative incomes, praiseworthy standards of rural living, and cultural advancement."

It is doubtless true, as Director Coffey states, that in the past "it has frequently been difficult for natural science workers to see an important place for social science in the scheme of agricultural teaching and research." It is also evident that "through their determination to discover principles and to secure reliable measurements of relationships the workers in social science are winning the respect of the natural scientists."

All this is well, for as Director Coffey points out, "if we are to secure the full benefits of natural science teaching and research, under present conditions in agriculture, we must have a sound and adequate development of social science. It is the science upon which we must rely for finding the ways and means of making adjustments, of balancing production to the needs and desires of the people. Unless these things are done, natural science teaching and research will be greatly weakened as potent influences in rural life. If they are done, if production is expanded only as fast as there is need for it, then the gains or benefits from natural science can be turned into better living rather than in surplus production. . . .

"The sources of wealth are to be found in goods and services. The farmer's source of wealth lies in goods which he produces, hence he must maintain an active interest in production. In its productive phases agriculture is a biological industry and hence as subject to change and variation as the biological forces themselves. The natural science worker in agriculture need have no fear of ever being out of a job, for his services will always be in demand. He will continue to be called upon to make discoveries and to work out their applications. It will remain for social science to lead in determining where, how, and how rapidly they shall be applied. So for best results, in fact for safe results, it becomes apparent that a knowledge of natural science must dovetail with a knowledge of social science. In turn each becomes the handmaiden of the other."

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**Studies of lignin in wheat straw with reference to lodging,** M. PHILLIPS, J. DAVIDSON, and H. D. WEIHE (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 7, pp. 619–626*).—The authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., showed that "wheat stalks from the plats which received sodium nitrate and where lodging had occurred in nearly all cases contained a higher percentage of methoxyl and lignin than did the stalks from the plats which received no nitrate and where no lodging had taken place. The cellulose was also greater, except in the last stages of growth, in the stalks from the plats where lodging had occurred than in the stalks from the plats where the plants did not lodge. . . .

"The increase in lignin caused by an early application of sodium nitrate seemed to be directly related to the rate of application. The application of even excessive quantities of sodium nitrate to wheat at heading time did not bring about any appreciable increase in the lignin content of the straw. In the early stages of growth the ash content was higher in the stalks from the fertilized plat (lodged) than in those from the unfertilized plat (not lodged), but in the later stages the relation was reversed.

"Sodium nitrate caused a distinct decrease in the silica content of the straw. The results on the silica content of the straw seem to furnish new evidence in support of the original view of Liebig, who maintained that lodging was caused by a deficiency of silica in the straw."

**On the breakdown of cystine and of cysteine by exposure to light** [trans. title], F. LIEBEN and E. MOLNAR (*Biochem. Ztschr.*, *230* (*1931*), *No. 4–6, pp. 347–352*).—Both cystine and cysteine were found to show, when exposed either to the light of a quartz tube mercury vapor lamp or to diffuse daylight, a breakdown which, though quite definite, was, especially in the case of the cysteine,' much slower than that of aromatic amino acids. The decomposition of cystine in diffuse daylight proceeded only in an alkaline medium, but in the case of the cysteine it was necessary to work with an acid medium since in alkaline solution the cysteine was decomposed even with no exposure to light. For the reaction in acid solution the use of hematoporphyrin as a sensitizer was found necessary. Although the sensitizer was necessary to the promotion of the reaction by the daylight, under the mercury vapor lamp little difference could be detected between the reaction rates of the sensitized and the unsensitized samples.

The irradiation products of the cystine reduced, when added to trytophane, the Voisenet color reaction of the last-named amino acid, an effect which the cystine itself did not have. A similar, though less marked, effect upon the Millon reaction of tyrosine was also observed.

Experiments were made on the effect of diffuse daylight upon the reduction of methylene blue by cysteine with the result that the difference between the rates of decolorization of the illuminated and of the nonilluminated samples increased with decreasing pH values, whereas the decolorization periods were themselves sharply increased.

**On the relation between cholesterol and certain protein fractions** [trans. title], W. N. Nekludow (*Biochem. Ztschr., 232 (1931), No. 1-3, pp. 50-57*).—The author finds a certain part of the cholesterol content of normal horse and dog blood serum to be firmly united with the globulin fraction and with a part of the fibrin. A similar union with certain fractions of hen's egg albumin and a part of the fractions precipitable from horse blood serum by tungstic acid, used according to the method employed for the separation of the globulin and albumin fractions, was also observed. Less stable combinations of cholesterol with some protein fractions from the same sources are also noted.

**On the question of the presence of proteolytic enzymes in serum** [trans. title], K. Yokota (*Biochem. Ztschr., 232 (1931), No. 1-3, pp. 58-68, fig. 1*).—The serum of human blood was found capable of hydrolyzing, to a limited extent, animal blood fibrin, but it was unable to attack human blood fibrin. Serum from carcinomatous and from luetic patients was also incapable of attacking human fibrin, and had no greater effect upon animal fibrin than did serum from normal individuals. The effects of certain physiological experiments on the protease content of the serum are also noted.

**The inhibiting effect of oxidase on the reduction of sulphur by potato and gladiolus juice,** J. D. Guthrie (*Contrib. Boyce Thompson Inst., 3 (1931), No. 1, pp. 125-130*).—Noting that the sulfur-reducing reaction is "of especial interest, since it is characteristic of sulfydryl compounds such as glutathione and cysteine," the author presents results of experiments indicating that treatment of dormant potato tubers or gladiolus corms with ethylene chlorohydrin resulted in an increase in the power of the juice to reduce sulfur to form hydrogen sulfide. This action was increased by boiling the juice or by carrying out the reaction in a nitrogen atmosphere. Addition of unboiled juice to boiled juice resulted in a decrease in hydrogen sulfide production. Fresh juice appeared to catalyze the oxidation of hydrogen sulfide.

"These results are explained by the presence of oxidase in the unboiled juice. In the presence of oxygen, the oxidase exerts an inhibiting effect by catalyzing either the oxidation of the hydrogen donors responsible for the reduction of sulfur or the oxidation of hydrogen sulfide as it is formed. An explanation is given for apparent inconsistencies in the literature dealing with the effect of heat on the power of tissues and extracts to reduce sulfur."

**On the presence in apples and other fruits of a dihydroxyphenyl derivative and of a specific enzyme** [trans. title], K. Spitzer (*Biochem. Ztschr., 231 (1931), No. 4-6, pp. 309-313, figs. 2*).—In apples, pears, and other fruits the author established the presence of an orthodihydroxyphenyl derivative, of which the observed reactions (alteration by tyrosinase, etc.) made its identity with dihydroxyphenylalanin highly probable. An enzyme acting specifically upon the last-named compound was found in apples and pears. This enzyme was without action upon tyrosine. It is noted that the discovery of a chromogenic substance and of an enzyme having a specific action upon it furnishes a possible explanation of the brown coloration of apple tissues.

**On the presence of ergosterol in the human brain** [trans. title], I. H. Page and W. Menschick (*Biochem. Ztschr., 231 (1931), No. 4-6, pp. 446-459, figs. 4*).—A study was made of the absorption spectra of the purified sterol fractions from brain tissue at various stages of development from that of the fetus to that of the adult. The sterols from the younger stages showed absorption maxima at 294, 283, and about 250$\mu$, the first two maxima being ascribed to ergosterol, while the origin of the broad absorption band at 250$\mu$ could not fully be explained. Precipitability by digitonin and the effect of the in-radiation of the substance with ultra-violet light supported the authors' opinion as to the identity of the substance responsible for the absorption maxima at 294 and 283μ with ergosterol The absolute quantity of the ergosterol present in the brain tissues examined had its maximum in the case of an individual less than 1 year old and became noticeably less at the higher ages.

**Influence of solvents on the activation of ergosterol,** C. E BILLS, E. M. HONEYWELL, and W. M. COX, JR. (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 601–604, fig. 1*).—Following the method noted previously (E. S. R., 61, p. 294), activation curves have been obtained for ergosterol irradiated in cyclohexane and ether and these compared with the previous curve for alcohol. The three curves of the activation in biological units plotted against time were of the same general shape but widely different dimensions. With alcohol, the maximum cod-liver oil coefficient was reached in the shortest time, 22.5 minutes, but the maximum was lowest (250,000) and the decline in potency most rapid. With cyclohexane, the maximum was higher (330,000) and was reached in 27 minutes, after which the decline was more gradual. With ether, the maximum was by far the highest (710,000) and was reached in 4 hours and 12 minutes, with a relatively more rapid but absolutely less rapid decline to a cod-liver oil coefficient of 25,000 after 18 hours.

Spectrographic examinations made in parallel showed no structure definitely attributable to the vitamin, but apparently a mixture of decomposition products or by-products, the composition of which was influenced by the conditions of the irradiation.

The authors are unable to offer any satisfactory explanation for the different effects of the various solvents.

**On the behavior of phosphate buffer mixtures with various cations** [trans. title], S. M. NEUSCHLOSZ and R. PÉREZ IBÁÑEZ (*Biochem. Ztschr., 232 (1931), No. 1–3, pp. 106–122, figs. 4*).—An analysis was made of the Sörenson figures for the pH values of the phosphate buffer mixtures, the tabulation of the calculated and the actually determined figures bringing out the inaccuracies of the previously accepted formula, while at the same time it was shown that much closer approximations of the actual experimental results can be calculated by the use of a modified equation of which the derivation is given. Report is made of pH measurements in potassium phosphate and ammonium phosphate mixtures, and a study of the effects of total concentration and of neutral salts on pH values in solutions of the potassium and ammonium phosphates and of freezing point determinations and conductivity measurements in the same buffer solutions.

The new equation, taking into consideration some factors not taken care of by the generally accepted formula, is shown to be practically in exact accordance with the experimental figures given.

The pH values of primary and secondary ammonium phosphate solutions were found always lower than those shown by the corresponding potassium salts, the difference being attributed first to a lessening of the activity of the ion $HPO_4$ in the presence of ammonium ions, and second to the hydrolysis to which secondary ammonium phosphate is subject in relatively alkaline solutions. Taking these two conditions into consideration, the authors developed the buffer equation for ammonium phosphate mixtures, which gave figures in good agreement with the results of actual measurements.

The differences between the acidities of potassium phosphate and ammonium phosphate mixtures increased with the rising total phosphate content and with additions of sodium chloride. The osmotic and conductivity factors for diammonium phosphate were smaller than those shown by the dipotassium salt solutions of like concentration, but the primary phosphates did not show these differences.

**On the general theory of boiling-point rules**, T. S. Wheeler (*Phil. Mag. and Jour. Sci., 7 ser., 12 (1931), No. 78, pp. 685–689*).—"No attempt has yet been made . . . to treat the theory of boiling-point rules in a general manner. To do this is the object of the present paper." The work presented consists of mathematical analyses of (1) boiling-point rules for temperatures of equal vapor pressure, (2) boiling-point rules involving relations other than that of equality between vapor pressures, and (3) the extension of boiling-point rules to liquids other than a standard liquid. Following this, the general principle underlying all boiling-point rules is indicated.

**An apparatus for the continuous extraction of large quantities of liquids at elevated temperatures** [trans. title], F. Weede (*Biochem. Ztschr., 231 (1931), No. 1–3, pp. 173, 174, fig. 1*).—The apparatus described and figured consists essentially of a cylindrical extraction vessel of a capacity of some 5 kg., into the top of which an inlet from the boiling flask brings the vapor of the solvent, to be condensed by a reflex condenser set into the head, and to drop from the condenser through the liquid to be extracted; while an escape tube, reaching the bottom of the extraction vessel and passing out somewhat below the vapor inlet, permits the return of the extractant to the boiling flask when the level of the liquid in the extraction vessel rises above the highest point in the return system. The apparatus is, therefore, designed only for solvents heavier than the liquid to be extracted. A second condenser, in series with the solvent condenser, returns the water or other liquid used in the heating jacket and so permits the continuous use of a small quantity of jacketing liquid.

**A new titration colorimeter** [trans. title], K. Mayer (*Biochem. Ztschr., 231 (1931), No. 4–6, pp. 314–316, fig. 1*).—The device described and illustrated brings together for comparison in a divided-field eyepiece the light transmitted, respectively, through the solution undergoing titration and a standard solution or standard glass color filter. The titration vessels, of which, in the design of the apparatus here shown, either 40 or 100 cc. sizes may be used, are set in a box supported on a suitable stand and provided with openings over which the titration vessels and the color standard are placed, an arrangement of prisms turning the light passing down through the two openings into the divided-field eyepiece, which projects horizontally forward over the front of the boxlike portion of the apparatus, near its base. A vertical support rod centrally placed directly behind the box carries a revolving head holding two pairs of burettes, so that any one of the four may be brought over the titration vessel merely by turning the head.

**The applicability of two-color indicators to the photometric determination of hydrogen-ion concentration** [trans. title], H. Linser (*Biochem. Ztschr., 230 (1931), No. 4–6, pp. 285–289, figs. 4*).—A condensed mathematical discussion of the underlying principles of the application of indicator photometry to the measurement of H-ion concentration is followed by a brief statement of the method used, and the experimental results are presented in the form of graphs and a short discussion. It is concluded that in general only the single-color indicators are capable of giving optimal results in the photometric determination of H-ion concentration. The two-color indicators appeared for the most part ill-suited to this use.

**A titrimetric method for the determination of inorganic phosphorus in blood serum** [trans. title], L. Cannavò (*Biochem. Ztschr., 237 (1931), No. 1–3, pp. 136–138*).—The author describes an adaptation of the common procedure of precipitation by magnesia mixture, re-solution of the precipitate and conversion to phosphomolybdate, treatment with excess of standard sodium hydroxide, and titration of the excess with standard hydrochloric acid, the modification of detail being such as to permit accurate determinations in 1 cc. of blood serum. It is stated further that even from 0.5-cc. samples of the serum usable figures were obtained. Prior to the precipitation of the phosphate, calcium was removed from the serum by treatment with ammonium oxalate.

**Electro-ultrafiltration, a method for the determination of the physical status of the minerals in the serum** [trans. title], R. SPIEGLER (*Biochem. Ztschr., 230 (1931), No. 4–6, pp. 253–258, figs. 2*).—Essentially, the procedure detailed consisted in carrying out first an ultrafiltration through a collodion filter membrane in the usual manner, with the aid of the suction pump. The residue retained by the filter after the more usual form of ultrafiltration is further treated, without removal from the cup of the suction filtration set-up, with an electric current introduced by means of a platinum anode on the walls of the filter cup and a platinum cathode surrounded by a balloon-form filter covered with a collodion membrane. The applied voltage was gradually increased with the increasing resistance of the material under treatment, a current flow of more than 0.5 ampere being avoided, however, in order to prevent excessive heating, and the process was continued for about 1 hour after the solution appeared no longer to conduct the current at all. The cathode filter balloon then contained a clear solution in which the cations could readily be determined.

**On the microdetermination of calcium and phosphorus in the blood and in the tissues** [trans. title], G. WIDMARK and B. VAHLQUIST (*Biochem. Ztschr., 230 (1931), No. 4–6, pp. 245–252*).—The principal improvement here introduced into the methods mentioned consists in both cases in the washing of the precipitate with the use of a small porous porcelain filter thimble. In the case both of the calcium, precipitated as the oxalate and determined by permanganate titration, and of the phosphorus, precipitated as phosphomolybdate and finally determined by titration with 0.04 N sodium hydroxide, the original sample is digested with sulfuric acid to partial destruction of the organic constituents and is further heated with the addition of successive small portions of nitric acid until clear, after which the procedure, up to and through the precipitation, is of the usual type.

The figures obtained indicate the possibility of determining calcium in 2-cc. plasma samples with an error of not over from 2 to 3 per cent, phosphatid phosphorus in 1 cc. of plasma, and acid-soluble phosphorus in 2 cc. with but 1 per cent error. To attain this degree of accuracy in analyses of tissues, it is considered necessary that the samples should contain from 0.2 to 0.3 mg. of calcium and from 0.05 to 0.1 mg. of phosphorus.

**The microchemical determination of lead and mercury in the organism** [trans. title], H. BÜLL (*Biochem. Ztschr., 230 (1931), No. 4–6, pp. 299–303*).—A sulfide precipitate having been obtained from a suitable solution of the completely oxidized material to be tested, the sulfide was redissolved in hot dilute nitric acid, this solution was evaporated to dryness, and the residue was taken up in three drops of 0.1 N nitric acid. One drop of this material was evaporated on a slide, treated with a drop of 2 per cent copper acidity solution, again evaporated, and then treated further with a small drop of a reagent consisting of a mixture of equal parts of glacial acetic acid, saturated ammonium acetate solution, and water, to which mixture was added an equal volume of a saturated solution of potassium nitrite. A small drop of this reagent was permitted slowly to flow over the dried residue on the slide, scratching of the slide being avoided so that the crystals might not be too minute. In the presence of lead, small brown and larger black cubic crystals were seen on examination with the microscope. The compound formed is described as the triple nitrite, $K_2CuPb(NO_2)_6$.

The two mercury tests given consisted (1) in taking up the mercury as the free metal from the solution of the completely oxidized sample on a piece of bright copper wire, the mercury being subsequently distilled off in a small glass tube so that the minute drops of condensed mercury in the cooler part of the tube could be recognized microscopically, and (2) in the precipitation of crystals, considered readily identifiable under the microscope, of mercury cobalt thiocyanate.

**A colorimetric iron method for biological materials,** L. Ascham (*Jour. Home Econ., 23 (1931), No. 8, pp. 776–778*).—This contribution from the Georgia Experiment Station describes slight modifications in the Kennedy method for determining iron in biological materials.

**Colloidal zirconic acid as a reagent for the removal of proteins** [trans. title], J. Erdös and J. Sürü (*Biochem. Ztschr., 231 (1931), No. 1–3, pp. 6–12, figs. 4*).—A new method for the preparation of zirconic acid from zirconium tetrachloride was developed, the procedure consisting essentially in the heating of the tetrachloride, finely ground, with glacial acetic acid and further heating in a stream of dry steam. This treatment was necessitated by the failure of the zirconium tetrachloride to hydrolize further than the oxychloride, $ZrOCl_2$, even on prolonged boiling with water. By means of filters of known pore diameter the particle size of the zirconic acid ($Zr(OH)_4$) obtained was measured.

The colloidal suspensions of the new reagent were tested as protein precipitants with respect to gelatin solutions, blood serum and plasma, and solutions of albumin, globulin, and fibrinogen. The characteristics of zirconic acid as a protein precipitant, and the advantages of its use for this purpose, are considered, and experimental results are noted. It was found that a 5 per cent suspension of the reagent was most suitable.

**On the application of the method of Folin to the determination of amino nitrogen in 0.2-cc. samples of blood** [trans. title], S. A. Poworinskaja (*Biochem. Ztschr., 232 (1931), No. 1–3, pp. 69–71, fig. 1*).—Finding neither the method of Van Slyke (E. S. R., 26, p. 22) nor that of Folin (E. S. R., 53, p. 711) applicable without modification to the examination of the small samples to which he wished to limit himself, the author reduced the quantities of the reagents used in the Folin method to one-fifth those originally prescribed.

Because of the small volume of liquid for comparison it was necessary to use the Autenrieth colorimeter in place of the Dubosque, and for filling the wedge of the Autenrieth instrument a permanent standard color solution was deemed necessary. This solution was made up of 30 cc. of 1:10,000 methyl orange solution and 5 cc. of carbol-fuchsin solution (1:10,000), to each 11 cc. of which mixture were added from 1 to 10 drops of a 1:200 litmus extract and from 2 to 8 cc. of water. Comparing this more permanent standard in the colorimeter with the Folin standard, the author found it possible to obtain a very satisfactory color match. The more permanent color solution could be used for a series of determinations in the wedge colorimeter, for which use, it is stated, the Folin standard was found unsuitable.

**A microdetermination of the reduced and of the total glutathiones of the liver** [trans. title], J. Kühnau (*Biochem. Ztschr., 230 (1931), No. 4–6, pp. 353–372*).—The effects of the dilution factor, of the acidity, and of the temperature on the iodine-reducing power of crystalline glutathione were investigated, together with the reducing action of sodium cyanid on oxidized glutathione in very dilute solutions. On the basis of the results obtained a method for the determination of the reduced and of the total glutathione in 0.5-gm. samples of liver was elaborated, the range of error of the results being indicated as ±4 per cent.

**A note on the iodometric titration of glutathione** [trans. title], E. J. King and C. C. Lucas (*Biochem. Ztschr., 235 (1931), No. 1–3, pp. 66–69, figs. 2*).—The authors' results indicate that accurate values for the glutathione content of any solution can only be expected if the iodine titration be carried out at an acid reaction and at a temperature below 25° C. A graph of the pH relations of the titration shows a curve which begins to rise between the pH values 5 and 6. The temperature data upon which the limitation above noted is based are similarly shown.

**The determination of potassium and of nitrites in very dilute solutions** [trans. title], R. A. Herzner (*Biochem. Ztschr., 237 (1931), No. 1–3. pp. 129–132*).—The author proposes to determine both nitrites and potassium, in 1-gm. samples of soil, for example, by an application of the reaction of the diazotization and azo dye formation in an α-naphthylamine-sulfanilic acid solution. The potassium is precipitated by a sodium cobalt nitrite reagent in the form of potassium cobalt nitrite, of which the nitrite content serves as the basis of a colorimetric determination carried out like that of the nitrite content itself.

## METEOROLOGY

**The future of agricultural meteorology,** W. A. Mattice (*U. S. Mo. Weather Rev., 59 (1931), No. 7, pp. 274, 275*).—Attention is called to the inadequacy of data from ordinary meteorological investigations as a basis for statistical studies of crop production as related to weather conditions. "To enable us to know just how the weather is affecting a crop at any time, to forecast crops accurately, and to practice agricultural meteorology as a science and not as an art, we need accurate and comparable data of weather and of crop progress, with the details of various weather phases and of crop development from planting to harvest accurately observed and recorded on the ground."

**The influence of weather on crops, 1900–1930: A selected and annotated bibliography,** compiled by A. M. Hannay (*U. S. Dept. Agr., Misc. Pub. 118 (1931), pp. 246*).—This bibliography contains 2,324 references to literature relating mainly to the influence of weather on the germination, growth, development, susceptibility to disease, and yield of "most forms of vegetation with the exception of flowers and root crops." It is stated that the bibliography does not include references to studies of the influence of weather factors on soils, animals and animal products, and insect pests; tree rings; effect of electric and other artificial light on plants; irrigation as a substitute for rainfall; influence of weather on crops in storage and on maturity as related to storage; effect of lightning and of moonlight; phenological observations; frost protection except when associated with other pertinent information; or publications concerning the organization and administration of agricultural meteorological research in various countries. It is also noted that references to accounts of certain bioclimatic, microclimatic, and agro-ecological investigations representing significant recent advances in the study of the more intimate and exact relations of weather to crops are not included.

**The drought of 1930,** J. C. Hoyt (*Jour. Amer. Water Works Assoc., 23 (1931), No. 11, pp. 1822–1864, figs. 11*).—This report "seeks to outline the nature and extent of the drought of 1930 as compared with past droughts, in terms of rainfall, run-off, and ground water. It sketches the effects upon water supplies for a variety of human purposes, including agriculture, power, navigation, city supply and waste disposal, and recreational and industrial uses; it also touches upon the social, political, and economic elements involved." The report is preliminary to a more complete account to be published by the U. S. Geological Survey.

**Investigations of rain water** [trans. title], F. HANSEN (*Tidsskr. Planteavl, 37 (1931), No. 1, pp. 123–150, fig. 1, Eng. abs. pp. 149, 150; abs. in Deut. Landw. Rundschau, 8 (1931), No. 2–3, pp. 116, 117*).—From determinations of ammonium and nitrate nitrogen in rainfall at several of the Danish experiment stations, the author concludes that "in Denmark the annual precipitation contains about 8 kg. nitrogen per hectare, of which two-thirds is present as ammonia, one-third as nitrate. . . . The ammonium content was great with southerly winds; the nitrate content was unaffected by wind direction. The first precipitation after a drought of several days contained a large amount of ammonium and nitrates, and a small amount of precipitation contained more of these substances than a large amount. Rain from a thunderstorm contained no more nitrate than other rain, whereas hail often contained very much."

Determinations of the chloride content of the rainfall showed that "at Askov about 30–40 kg. chloride was added to the soil per hectare annually from the precipitation and at Spangsbjerg 90 kg. The content of chloride was very great in rainfall accompanied by strong westerly winds." It is stated that "the chloride content in precipitation is largely derived from the water of the ocean. This is blown up as a dust as the breakers beat along the beach, and then borne away in the air together with chloride salts. One of the causes of 'wind wear' of the deciduous trees of western Jutland is the fact that the leaves and young shoots on the wind side are destroyed by the salt in the rain."

**Monthly Weather Review, [July–August, 1931]** (*U. S. Mo. Weather Rev., 59 (1931), Nos. 7, pp. 259–293, pls. 14; 8, pp. 295–329, pls. 7, figs. 9*).—In addition to detailed summaries of climatological data and weather conditions for July and August, 1931, solar and aerological observations, and bibliographical and other information, these numbers contain the following contributions:

*No. 7.*—Lightning Investigation as Applied to the Airplane (illus.), by A. O. Austin (pp. 259–264); Observations from Airplanes of Cloud and Fog Conditions Along the Southern California Coast, by J. B. Anderson (pp. 264–270); Southern Arizona Flying Weather, by L. C. Walton (pp. 270–272); Diminishing Winter Radiation from Sun and Sky at Madison, Wis., by E. R. Miller (pp. 272–274); The Future of Agricultural Meteorology, by W. A. Mattice (pp. 274, 275) (see p. 311); and Tor Bergeron's Über die Dreidimensional Verknüpfende Wetteranalyse, by E. Bjorkdal, trans. by A. Thomson (pp. 275–277).

*No. 8.*—Some Problems of the Boulder Canyon-Colorado River Development, by J. L. Bacon (pp. 295–297): Sounding-Balloon Observations Made at Broken Arrow, Okla., during the International Month, December, 1929 (illus.), by L. T. Samuels (pp. 297–309); Wind Velocities at Different Heights Above Ground, by C. F. Marvin (p. 309); The Weather and Radio, by W. J. Humphreys (pp. 309, 310; An Error in the Maximum-Thermometer Reading, by W. J. Humphreys (p. 310); and A Remarkably Heavy Rainstorm in the Chicago Area (illus.), by O. T. Lay (p. 311).

## SOILS—FERTILIZERS

**[Soil and fertilizer studies in Missouri]** (*Missouri Sta. Bul. 300 (1931), pp. 96–102, figs. 2*).—Earlier work has been noted (E. S. R., 63, p. 718).

*Studies on basic exchange in soils, H. Jenny.*—"In all cases, both at alkaline and acid reaction, the basic exchange was closely associated with the hydration of ions. However, the various colloids also exerted their specific influences which resulted in qualitative and quantitative differences."

Difficulties were encountered in the titration of exchanged hydrogen ions on account of the aluminum salts present. It was found that "the end point of the titration varied greatly with the nature of cations present."

*The effect of the properties of soil colloids on the growth of soybeans, H. Jenny.*—In the absence of readily available (ionic) calcium the incidence of damping off among soybean seedlings was heavy. Adsorbed or free hydrogen ions were of little effect as a control of the disease, free ionic calcium being necessary in the experiments illustrated entirely to prevent the occurrence of the disease, both at high and at low hydrogen-ion concentration, while calcium adsorbed by the soil colloids showed itself less effective, and "calcium ions bound by crystal lattice forces (anorthite) were not able to control the disease." Potassium and magnesium were not as effective at any concentration as was the calcium ion.

*The nitrification of sweetclover,* W. A. Albrecht.—Prolonged trials (40+ years) of continuous wheat on two plats are noted. One plat was heavily treated with commercial fertilizers, the other receiving no treatment. On the fertilizer plat sweetclover caused an accumulation of ammonia for 6 weeks, followed by "a decided nitrate production." In the untreated plat "ammonia accumulated for 8 to 10 weeks, and the nitrate production was very slow. The application of lime influenced nitrate production markedly in this plat while it had no marked effect" on the fertilizer plat, which "had been receiving calcium phosphate and showed no marked effects on nitrification when limestone was applied."

*The influence of nitrogenous fertilizer on the "firing" of corn,* M. F. Miller and J. F. Lutz.—A greenhouse test is reported. Results of variations in soil moisture and in nitrogen dosage with "standard applications" of phosphates and potassium compounds were taken to indicate that "liberal applications of nitrogen applied as a side dressing to corn when it is about 18 in. in height" caused the least dying off of the lower leaves, whereas "applications of nitrogen with potash and phosphate at planting time increased the number of dead leaves following a drought period."

*Crop rotation and fertilizer experiments,* M. F. Miller and H. H. Krusekopf.—The unfavorable physical condition of the soil on plats growing the same crops continuously for 42 years has become apparent. "Unfavorable weather conditions, such as excessive rains or dry periods, cause the soil to 'bake' and 'crust.' A satisfactory stand of clover can now be rarely obtained on those plats receiving no soil treatment. Low yields for all untreated and one-cropped plats are becoming usual occurrences. Frequent heavy applications of fertilizer apparently have not modified in any way the physical properties of the soil."

Pepper grass (*Lepidium virginicum*) has become the dominant weed on the wheat plat treated with ammonium sulfate, while 90 per cent of the weed growth on the corresponding plat receiving sodium nitrate is bracted plantain (*Plantago aristata*).

*Commercial fertilizer on corn,* M. F. Miller and H. H. Krusekopf.—The application of a mixed fertilizer low in nitrogen as a side dressing at the second or third plowing has not been profitable. Mixed fertilizers "of medium to low grade" were applied at the time the corn was planted, without particularly good results.

*Nitrogen accumulation in exposed subsoils,* M. F. Miller and H. H. Krusekopf.—The free use of lime and fertilizers showed itself capable of raising the nitrogen content of an exposed subsoil from 0.083 to 0.090 per cent as against an equilibrium content of about 0.12 per cent in surface soil. Heavy crops of sweetclover were grown on the treated subsoil (the same treatment was given the subsoil not treated with fertilizers "whenever a stand could be secured"); and this fertilized plat of subsoil yielded "fair crops" of wheat.

**A method for determining size-frequency distribution in soils,** E. E. Barnes (*Diss., Ohio State Univ., Columbus, 1929, pp. 3½, pls. 2, figs. 9*).—The apparatus and method described constitute a further development of those proposed by W. J. Kelley as a modification of the principle and procedure originated by Wiegner (E. S. R., 41, p. 621). Kelley's narrow side tube is retained in the new modification, but the inclined position of the side tube is rejected in favor of the vertical side tube of the Wiegner form.

"The apparatus described here is unique in the method which is used to measure the height of the water in the side tube. This is done by means of a needle which is geared to a dial in such a way that turning the dial through one division $\frac{1}{127}$ of a revolution) lowers the needle 0.0005 cm. This needle is connected to one pole of a battery in series with a galvanometer. The other pole of the battery is connected to an electrode which is fused into the wall of the side tube about 1.25 in. below the level of the water. When the needle is lowered until it touches the water the fact becomes known by a sharp deflection of the galvanometer. One other departure from the Kelley apparatus is the method of preventing evaporation from the surface of the suspension and the surface of the water in the side tube. This is done by closing the tops of both tubes and connecting them with a rubber tube to prevent building up an uneven pressure in the two tubes.

"It was found that the fall in the water in the side tube was not always the same for a definite amount of soil settling out, so that the proportionality factor [must be determined] experimentally for each run. A method of doing this is described. An hypothesis to explain this is offered. Two methods of plotting the distribution curve are described."

**[Soil Survey Reports, 1927 Series]** (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1927, Nos. 18, pp. 30, figs. 2, map 1; 20, pp. 38, fig. 1, map 1*).—The two reports here noted were prepared with the respective cooperation of the Michigan Experiment Station and the University of Nebraska.

No. 18. *Soil survey of Mecosta County, Michigan*, R. Wildermuth and J. F. Fonder.—Mecosta County, west central Lower Michigan Peninsula, occupies an area of 360,320 acres of lands "characterized by considerable diversity of surface relief." "As a whole, the county has an adequate natural drainage system."

Of the 21 types of 14 series of soils found in the county, those of primary areal importance are Isabella sandy loam, "naturally well drained," and "utilized successfully for general agriculture," which covers 23.0 per cent of the area surveyed, Coloma sand aggregating 34.8 per cent, and Plainfield sand amounting to 13.1 per cent.

No. 20. *Soil survey of Thayer County, Nebraska*, E. A. Nieschmidt et al.—Thayer County, southeastern Nebraska, occupies 368,000 acres of a level to steeply rolling and, in part, hilly plain. The two principal soil types are Crete silt loam and Hastings silt loam, covering, respectively, 36.3 and 28.1 per cent of the total soil area. Record is also made of 25 other types referred to 16 series.

**The management of Nebraska soils,** P. H. Stewart and D. L. Gross (*Nebr. Agr. Col. Ext. Circ. 133 (1931), pp. 39, figs. 22*).—The circular presents a semipopular treatment of the following topics: What is soil; soil texture; soil structure; plant food elements; soil testing; losses due to cropping; some climatic factors influencing soil management; regional soil differences; maintaining soil fertility; methods for soil maintenance; soil moisture; and special soil problems, including irrigated soils, soil erosion, liming, commercial fertilizers, alkali soils, and sandy soils.

**Surface run-off and erosion in relation to soil and plant cover on high grazing lands of central Utah, G. Stewart and C. L. Forsling** (*Jour. Amer. Soc. Agron., 23 (1931), No. 10, pp. 815–832*).—Summer and winter precipitation are recorded in this contribution from the Intermountain Forest and Range Experiment Station of the U. S. D. A. Forest Service, and "eroded and noneroded soils were compared on the newly vegetated watershed and on another area about 2 miles away. The noneroded, dark-colored surface soil of the newly vegetated watershed contained on the average 0.337 per cent nitrogen as compared to 0.258 per cent and 0.088 per cent on the partly eroded and badly eroded areas, respectively. The badly eroded soils supported only annuals or nonpalatable perennials, while the partly eroded soils supported palatable perennial plants and the noneroded soils a good growth of forage grasses in addition to palatable perennials. The other area 2 miles away showed 0.382 per cent nitrogen for uneroded dark-colored soils which supported grasses, 0.202 per cent for the partly eroded soils which supported only poor perennial plants, and 0.043 per cent on the exposed raw clay subsoil of a road cut which produced after 7 years only a few annual knotweeds.

"Water-soluble phosphorus was not found to be as closely related to the degree of soil erosion or to the kind of plants supported. Phosphorus is probably not a limiting plant nutrient on these soils."

**The determination of replaceable hydrogen in manganese dioxide-free Hawaiian pineapple soils, L. A. Dean and O. C. Magistad** (*Jour. Amer. Soc. Agron., 23 (1931), No. 10, pp. 832–843, figs. 3*).—It was the finding of the authors of this contribution from the Hawaiian Pineapple Canners Experiment Station that "acetate leaching solutions having different cations will give different values for replaceable hydrogen. When an acetate solution is leached through a soil until the maximum amount of hydrogen has been replaced which the solution is capable of removing, and the acetate washed out, the pH of the residual soil is greater than that of the original leaching solution.

"Calcium is the logical cation to use in the replacement of hydrogen during the process of determining replaceable hydrogen. Leaching is more efficient than shaking in the replacing of hydrogen by calcium from a calcium acetate solution.

"The quantity of hydrogen replaced from a soil by calcium from a calcium acetate solution is a function of the volume of solution used and the rate of leaching."

The proposed procedure consists in first testing the soil for the presence of manganese dioxide by treatment with 15 per cent hydrogen peroxide, after which, "if no violent effervescence occurs due to the presence of manganese dioxide, the following procedure is applied: Twenty gm. of soil are placed in a leaching tube . . . and 1,500 cc. of 0.5 N calcium acetate adjusted to pH 6.5 are leached through it at the rate of 15 drops per minute. The leachate is then boiled to drive off the $CO_2$ and cooled to room temperature. It is then electrometrically titrated with standard calcium hydroxide to the pH of the original leaching solution, using a quinhydrone electrode."

It is emphasized, however, that the method is applicable only to soils which do not contain manganese dioxide in any appreciable quantity.

**The effect of lime, superphosphate, and potash on reaction of soil and growth and composition of alfalfa, M. C. Sewell and W. L. Latshaw** (*Jour. Amer. Soc. Agron., 23 (1931), No. 10, pp. 799–814*).—In the first (E. S. R., 60, p. 509) of a group of three experiments of the Kansas Experiment Station, of which the second and third are here reported, it was observed that "applications of superphosphate tended to modify the specific reaction of the soil under investigation, reducing the degree of acidity. From the results of Experiments II and III, it is apparent that this reduction in acidity lasts for only a short period following the application of superphosphate. Subsequent determinations made several months later show that superphosphated soils have about the same reaction as the untreated soil. The alfalfa yields in Experiments II and III were in agreement with Experiment I in that the application of superphosphate in addition to lime seemed to produce yields equal to those secured from heavier rates of applying lime alone. That the application of lime and superphosphate changes the rate of absorption of some of the primary nutritive elements is another conclusion of Experiment I with which the results of Experiments II and III agree. . . .

"Where no superphosphate was applied, the percentage of phosphorus in the plants decreased with applications of lime, except where the lime, 3 per cent by weight, was mixed throughout the soil column. . . .

"The potassium composition of the alfalfa was very markedly affected by applications of lime, decreasing in proportion to the rate of liming. Since more calcium was absorbed in proportion to the rates of applying lime, it is possible that a greater amount of calcium absorbed by the cell structure may have affected the permeability of cell walls to potassium ions.

"A fourth statement in the summary of Experiment I was that evidence indicated that the response of a soil to a given nutritive element can not be determined from one rate of application of the fertilizer carrier of the element under consideration. Subsequent data of Experiments II and III substantiate this statement."

In Experiment III, "the soil with 3 per cent calcium carbonate produced in four cuttings 175.1 gm. dry weight of alfalfa in comparison with 130.5 gm. on soil receiving lime at the rate of 4 tons per acre. This is a difference of 34 per cent. Approximately this difference exists in the dry weights of the alfalfa produced in the high calcium soil compared with those receiving surface applications of calcium regardless of the amount of other fertilizer treatments."

**Preliminary study of chemical processes involved in the decomposition of manure by Agaricus campestris, S. A. Waksman and J. M. McGrath** (*Amer. Jour. Bot., 18 (1931), No. 7, pp. 573–581*).—The preliminary experiments recorded in this contribution from the New Jersey Experiment Stations consisted principally in the preparation of cultures and controls on the well-washed substrate, together with proximate analyses preceding and following the inoculation and growth period.

"The organism did not attack the hemicelluloses to any appreciable extent; there was an actual increase both in the relative concentration and in the absolute amounts, due no doubt to the synthesis of the mycelium which is rich in hemicellulose. The cellulose and the lignin have undergone most marked decomposition. The loss in these two complexes can account for practically all the loss in the total manure. This loss was 11.800—10.760=1.040 gm. The loss in cellulose was 3.334—2.845=0.489 gm. and in lignin 3.182—2.618=0.564 gm., the sum being 0.489+0.564=1.053, or exactly the same as the total loss in the culture."

Also, "the actual reduction in the organic matter was comparatively small. The organism decomposed of course larger quantities of the organic matter in the manure than shown in the analyses, but, due to the fact that it also synthesized large quantities of mycelium, the apparent reduction is comparatively small. However, certain definite facts are evident which are in full agreement with those observed in the previous experiments. The water-soluble organic matter increased materially over the control as a result of the growth of the fungus. It should be remembered that the manure was washed well with water before sterilization, thus reducing markedly its water-soluble constituents. The increase in these as a result of the growth of the fungus is due not so much to the actual formation of water-soluble substances in the decomposition of insoluble complexes as to the synthesis of the fungus mycelium rich in these substances."

**Some influences of the development of higher plants upon the microorganisms in the soil, IV, V, R. L. Starkey** (*Soil Sci., 32 (1931), No. 5, pp. 367–393, 395–404*).—This New Jersey Experiment Stations series (E. S. R., 62, p. 415) is continued.

IV. *Influence of proximity to roots on abundance and activity of microorganisms*.—"Microorganisms were much more abundant about roots. The most pronounced increases were noted in the region of the root surfaces where the organisms were many times as numerous as in the soil close to the roots. The general bacterial population and the bacteria of the Radiobacter group were affected by root growth to a much greater extent than the actinomyces and filamentous fungi. Greater numbers of bacteria were found on roots of legumes than on those of nonlegumes, but the nonlegumes exerted marked effects on the organisms. No characteristic effect of legumes was observed except in the region of the root surfaces. As many organisms were found in soils about roots of nonlegumes as in soils about roots of legumes. In general, the greater the distance from the region of extensive root development the smaller the number of bacterial inhabitants found in the soil. Effects of roots on fungi and actinomyces were noted only in materials obtained from the root surfaces.

"Greater amounts of carbon dioxide were produced from soils obtained from regions of extensive root development than from soils obtained at any distance farther removed from the plants. A close correlation appeared between the amounts of carbon dioxide produced by the soils and the abundance of bacteria detected in the samples. Nitrification was most active in soils obtained from regions of maximum root development."

A bibliography of more than 80 items is appended.

V. *Effects of plants upon distribution of nitrates*.—Reporting upon determinations of nitrate concentrations in soils about the roots of developing plants and in soils free from roots, this notes the observations that, under field conditions, plants greatly lower the nitrate content of soils; that the extent of removal of nitrates differs with the stages of growth of the plants; that the nitrate contents of soils at different distances from the center of root development are different, greater amounts of nitrates occurring at a distance from the absorption system of the plant; and other findings.

"It seems unlikely that the modification of the nitrate content by plant development is a factor of importance in bringing about the acceleration in microbial activity which has been observed to accompany plant growth." The results are discussed with reference to the influence of plant development upon variation in nitrate content of soils and the relationships between nitrate content, soil fertility, and microbial activity.

**The decomposition of green manures grown on a soil and turned under compared to the decomposition of green manures added to a fallow soil, N. R. Smith and H. Humfeldt** (*Jour. Agr. Research [U. S.], 43 (1931), No. 8, pp. 715–731, figs. 8*).—It is shown from the results of the experiments reported in this contribution from the U. S. D. A. Bureau of Chemistry and Soils that, although the rates and total quantities of carbon dioxide evolution were the same whether the rye and vetch tops were grown elsewhere and added to the fallow soil or were grown on the soil into which they were to be incorporated, "the effect on the soil microflora and nitrates is very different under the two conditions."

In a fallow clay loam high in nitrates, of which both limed and unlimed plats were used, "nitrate nitrogen as a rule decreased during the first 4 days and then increased to a peak at 14 days. In the limed soil the nitrates decreased at the end of the experiment, whereas in the unlimed soil they increased and finally surpassed the amount present in the former.

"Plate counts of microorganisms in the limed soil showed an immediate increase followed by a greater decrease. In the unlimed soil rye tops failed to increase the comparatively low numbers, whereas vetch showed a slight initial increase. The number of fungi and the pH value of the soil were not affected by the green manure treatment.

"The evolution of carbon dioxide was rapid, the greatest amount being given off on the third or fourth day after green manuring. After 12 or 14 days, the amounts given off were only slightly higher than that given off by the untreated soil.

"During the early stages of the decomposition of rye and vetch tops in the limed and unlimed soil, there was a direct ratio between the number of microorganisms and the carbon dioxide production and an inverse ratio between these and nitrate content. After decomposition was well advanced the same relationships were noted when rye tops were added to the limed soil, but not when they were added to unlimed soil."

In the cropped soil, "the nitrates were much lower under the growing plants than in the fallow soil; lower under the rye than under the vetch. After the crops were turned under there was a steady increase in nitrates in all cases. The limed soils showed a tendency to have less nitrate at the end [of 56 days] than they had at 35 days, whereas the unlimed soils showed a steady increase to the end of the experiment.

"The growth of the green manures did not affect the number of microorganisms, but in limed soil the decomposition of the roots and tops produced a secondary increase after the primary increase noted when only tops were added to the soil. Similar conditions prevailed in the unlimed soil of the rye series. But in the unlimed soil of the vetch series no effect of the decomposition of the roots on the plate counts was observed. The number of fungi was considerably greater in the soil where rye and vetch had been grown than in the fallow soil. However, turning under the green manure failed to increase these numbers. The pH value of the soil was likewise not changed.

"The evolution of carbon dioxide proceeded as it did when only tops were used, the unlimed soils producing the maximum amounts 1 or 2 days later than the limed soil. During the first few days of the decomposition, the production of carbon dioxide varied directly with the plate counts, but nitrate accumulation was not inversely proportional as was the case when only tops were added to fallow soil. During the remainder of the decomposition period no relationships were observed."

**The waste products of agriculture: Their utilization as humus,** A. Howard and Y. D. Wad (*London, New York, and Bombay: Humphrey Milford, Oxford Univ. Press, 1931, pp. XIV+167, pls. 14, figs. 9*).—The primary aim of this book is to present a working account of the "Indore process" of composting vegetational and other farm wastes (a systematic and continuous procedure carried out on a rather large scale with the production of a material ready for nitrification when applied to the soil and found, in the authors' experiments here recorded and illustrated, to be superior in texture and in its actual effect upon crops to artificial manures produced from straw and like materials by means of a mixture of starter chemicals).

The contents consist of an introduction; five chapters having the headings organic matter and soil fertility, the sources of organic matter, the manufacture of compost by the Indore method, the chief factors in the Indore process, and application to other areas; and four appendixes: The Manurial Problem in India; Some Aspects of Soil Improvement in Relation to Crop Production, by G. Clarke; Nitrogen Transformation in the Decomposition of Natural Organic Materials at Different Stages of Growth, by S. A. Waksman and F. G. Tenney; and An Experiment in the Management of Indian Labor, by A. Howard.

**Shall farmers exchange cotton seed for meal this year?** C. B. WILLIAMS (*North Carolina Sta. Agron. Inform. Circ. 65 (1931), pp. 2*).—On the basis of the fertilizer constituents assumed to be present, advice to exchange locally 1 ton of seed, if possible, for 1,400 lbs. or more of meal is given.

## AGRICULTURAL BOTANY

**Plant physiology,** E. C. MILLER (*New York and London: McGraw-Hill Book Co., 1931, pp. XXIV+900, figs. 88*).—It has been attempted in this book to summarize the more important findings of English, American, and continental plant physiologists, and to assemble the material in such form as to make the book available as a text for upper classmen and graduate students, and at the same time sufficiently comprehensive as a reference book for investigators in plant physiology. The work is devoted entirely to the physiology of the green plant, using freely the discussions and summaries of various investigators as cited.

**Morphology and biology of pollen, I, II** [trans. title], F. POHL (*Bot. Centbl., Beihefte, 46 (1929), 1. Abt., No. 2, pp. 247–285; 286–305, figs. 10*).—Of these two analytical presentations, the first deals with relations between pollen characters and pollination methods and ovary formation, and the second with surface adherents on wind-blown pollen.

**Influence of colloidal substances on the development of plant root systems** [trans. title], B. NIKLEWSKI and A. KRAUSE (*Jahrb. Wiss. Bot., 70 (1929), No. 1, pp. 158–162, figs. 4*).—Experimentation was successfully carried out during 1928 with sugar beet seedlings pregerminated in sand and afterwards supplied with nutrients, including colloids. It is concluded from the outcome that in nature as well as in cultures colloids of the soil in relation with fertilizers are to be regarded as promoting growth.

**Maximal yield and the daily course of carbon dioxide assimilation** [trans. title], P. BOYSEN-JENSEN and D. MÜLLER (*Jahrb. Wiss. Bot., 70 (1929), No. 4, pp. 493–502, fig. 1*).—The authors were not able to find support for the claims mentioned as asserted by Kostytschew et al. (E. S. R., 56, p. 325) as to daily variations of considerable range in photosynthesis rate. They claim that, given constant external factors and constant stomatal aperture, the intensity of carbon dioxide assimilation varies but little from the maximum in the course of the day. With good light conditions, failure to assimilate was not observed at any time.

**The state and the rôle of tannin in plants** [trans. title], H. HUBER (*Jahrb. Wiss. Bot., 70 (1929), No. 2, pp. 278–327, figs. 3*).—Having studied the relations and behavior of tannin during the germination of acorns of *Quercus ballota*, the author outlines his method and findings.

The peculiar behavior of tannin toward the solvents used (insolubility in 100 per cent acetone, ready solubility in 40 per cent acetone, and lower solubility in water) suggests that tannin in acorns is not free, but that it occurs in a state of adsorption. The bitter taste of acorns during swelling and sprouting is thought to be due possibly not to the presence of tannin but to a shifting of adsorption equilibrium, as it disappears on drying.

It was found that the total tannin of shoot plus cotyledon during germination appeared to increase somewhat, though the absolute content of the cotyledons alone decreased some 30 per cent. This points to a transfer of tannin from cotyledon to shoot, agreeing with what occurs in case of reserve materials. It is admitted, however, that it is not yet certain that tannin is a reserve substance.

**Permeability in the wheat grain coat** [trans. title], A. GURWITSCH (*Jahrb. Wiss. Bot., 70 (1929), No. 5, pp. 657–706, figs. 9*).—Results are given in considerable detail as obtained from a study of the permeability of the selective coat of the wheat grain to ions of various inorganic salts, to organic colorants, to iodine, and to corrosive sublimate.

**Resistance of roots to filtration** [trans. title], O. RENNER (*Jahrb. Wiss. Bot., 70 (1929), No. 5, pp. 805–838, figs. 4*).—Phaseolus plants grown in water were topped and to the lower cut surface water was applied, the roots being immersed in a solution of sugar or salts. A reversed water stream was produced, passing from the cut surface into the roots and out into the solution. Details and variations are outlined.

**Further studies on the path of the transpiration stream**, D. T. MACDOUGAL, J. B. OVERTON, and G. M. SMITH (*Carnegie Inst. Wash. Yearbook 27 (1927–28), pp. 172, 173*).—Determinations in previous years of the path of the transpiration stream (E. S. R., 56, p. 516), made largely by placing tree trunks in dyes, have brought to light a marked zonation of the transpiration stream moving through successive annual layers. A method has since been devised to apply dyes exclusively to certain annual rings and so to determine accurately the vertical path of the transpiration stream and the extent of radial movement to insheathing annual layers of xylem. These results were obtained by boring radially a hole toward or to the tree's center, screwing in the tapered threaded tube, then under pressure forcing exclusively into the rings at any desired depth the colored (fuchsin) solution. Subsequent cutting and splitting of the tree shows the actual paths and regions of penetration.

The failure of the dye to pass laterally shows that the xylem must not be regarded as a homogeneous physiological entity, but rather as a series of concentric cylinders functioning more or less independently; also that the transpirational pull of the coherent water column in older parts of the trunk is not exerted laterally from one annual ring to the next, even through the medullary rays. The dyes, however, eventually arrive at leaves in connection with xylem formed during the current year. There remains, therefore, the need to explain by what path the transpiration stream moves from the older formed to the foliar organs inserted in the current year's wood.

"The injection experiments described above show that dye starting up an annual ring more than one year old continues vertically through that ring until it reaches its distal end. If branches of the stem have annual rings in direct contact with the ring through which the dye is traveling, the dye will also move out into the branches and to the distal end of the given ring of the branch. When the dye starts up any given annual ring it may be several layers from the center of the stem. However, when it arrives at the distal end of the annual layer it is transversing the innermost ring at that part of the stem and one which is a solid instead of a hollow cylinder. On reaching the end of this innermost cylinder it then passes through the terminal portion (end) of the cylinder and into the base of the succeeding solid cylinder. Until this time the path of the dye has been through wood of a certain year's growth. The longitudinal movement from the end of the central cylinder results in its movement from wood of one season to wood formed the following season. The repetition of this longitudinal movement through successively formed cylinders of xylem eventually results in a movement of the dye to wood at the tips of stem and branches and to a region where the stem is but one year old. Here the wood is in contact with the leaves of the current year."

**Plant competition: An analysis of community functions,** F. E. CLEMENTS, J. E. WEAVER, and H. C. HANSON (*Carnegie Inst. Wash. Pub. 398 (1929), pp. XVI+340, pls. 32, figs. 30*).—"The present book is the second of a series [E. S. R., 54, p. 820] dealing with the functions of the plant community as a complex organism."

**A catalogue of common and scientific names of some Porto Rico plants** [trans. title], J. I. OTERO and R. A. TORO (*Porto Rico Dept. Agr. and Labor Sta. Bul. 37 (1931), Spanish ed., pp. 248*).—As indicated in the title, lists are presented of the common and botanical names of Porto Rico plants, with English equivalents for most of the better known species included in the appendix.

## GENETICS

**A genetic analysis of maize,** L. J. STADLER (*Missouri Sta. Bul. 300 (1931), p. 77*).—Frequency of mutation differed widely in different genes of corn, the most mutable gene studied yielding about 400 mutations per million gametes. A distinct and consistent variation was noted in frequency of mutation of the same gene in different families.

Considering effects of X-rays upon chromosome distribution, mosaic endosperms normally occurred with low but appreciable frequency for each seven chromosomes markable by genes for endosperm characters, and in frequency varied widely in different stocks. During the first three cell generations in endosperm development the average frequency of divisions unequaled for a given locus varied from 2 to 40 per 10,000.

**[The effects of X-ray treatment on corn],** L. J. STADLER, R. T. KIRKPATRICK, and W. R. TASCHER (*Missouri Sta. Bul. 300 (1931), pp. 72–75*).—When young corn embryos were X-rayed within 24 hours after fertilization and plants from seed thus treated were self-pollinated, in the next generation both induced mutations and chromosome markers segregated. About 30 induced mutations for seedling characters were found, with their indicated linkage relations. Similarly gene mutations were induced by X-ray treatment of mature seed (germinating or dormant), of pollen, or of young ear shoots, or of tassels.

Frequency of mosaic endosperm was increased about twentyfold by moderate irradiation and more than fortyfold by heavier treatments approaching the lethal limit. Mosaic endosperms showed aberrant behavior of two unlinked chromosome sections in the same cell division. Indications were that differences in frequency of loss characteristic of certain loci, as *C* and *Wx*, might be due to difference in position on the chromosome rather than to difference in frequency of loss of different chromosomes.

Many plants X-rayed during early embryogeny, although normal in growth vigor and appearance, produced pollen about 50 per cent aborted, and usually corresponding partial sterility also occurred among the female gametes. The proportion of partially sterile plants rose with increasing dosage. Treatments in later embryogeny or to the mature seed produced partially sterile sectors in otherwise normal tassels.

Distinct defectives much reduced in vigor and of several distinct types were found among plants treated in early embryogeny, and all reaching the flowering stage produced partially defective pollen. When treated embryos were heterozygous for certain plant characters some defective plants showed the recessive character. Delay of treatment until 5 days after fertilization produced chimeras in which the recessive character appeared in several broad sectors, in both main stalks and tillers. Later treatments, however, produced smaller sectors. Of different genes for plant characters, *B* and *G* were lost most often, while no losses of *Lg* were found.

X-rayed pollen applied to untreated normal ears produced many defective seeds, which in frequency increased with dosage, and plants from the viable seeds included partially steriles and defectives like those due to irradiation of the embryo. When treated pollen carried dominant genes for endosperm characters recessive in the female parent, loss of these genes was shown by appearance of the recessive characters in the seed produced. Frequency of loss of different loci was consistently different, being for each locus directly proportional to dosage. Genes for plant characters were lost similarly. Genetic results showed that chromosomally deficient gametes often functioned, and chromosomally deficient progeny were produced. Mature pollen contained three nuclei which were independently affected by the treatment. Treatments of the tassel during maturation resulted in aborted pollen and produced no defective seeds or defective progeny.

**Experiments on hybrid vigor and convergent improvement in corn,** F. D. RICHEY and G. F. SPRAGUE (*U. S. Dept. Agr., Tech. Bul. 267 (1931), pp. 22, figs. 10*).—Yields of $F_1$ crosses between selfed lines of corn back pollinated once to one parent were, in accordance with theory, almost exactly intermediate between the parents' yields and those of the $F_1$ crosses. Yields of progeny lines derived by successive generations of back pollinating to the same recurrent parent, with selection of the more vigorous plants in each generation, somewhat exceeded the theoretical yields for back pollinating without selection. $F_1$ crosses between these back-pollinated lines and the nonrecurrent parents also yielded more than the theoretical values for similar crosses with unselected back-pollinated lines. Excess yields of the selected back-pollinated lines, it seemed, might be attributed to dominant favorable genes retained by selection during back pollinating. The fact that yields of the crosses involving these lines also exceeded the theoretical values for back pollinating without selection appeared to support the hypothesis of dominant genes as the cause of hybrid vigor and to oppose the physiologic-stimulation hypothesis.

Crosses made following three or four generations of back pollinating yielded about the same as the $F_1$ crosses between the foundation parent lines, indicating that three or four generations of back pollinating to a recurrent parent was enough to recover lines behaving like that parent in crosses with the nonrecurrent parent. In these generations a permanent improvement of 13 to 15 per cent over the recurrent parent was indicated, allowing for differences in the degree of inbreeding. Improvement also was achieved in ability to resist lodging and in the quantity of pollen shed. Yellow endosperm was substituted for white and clear pericarp for red, all without changing significantly the behavior of the lines in crosses.

Convergent improvement (E. S. R., 58, p. 126), suggested as a means of improving selfed lines of corn without interfering with their behavior in hybrid combination, was found successful, and the results indicated that the method also may be used to increase the productiveness of $F_1$ crosses between selfed lines.

**Inheritance in a "constant" hybrid between Aegilops ovata and Triticum dicoccum,** J. W. TAYLOR and C. E. LEIGHTY (*Jour. Agr. Research [U. S.], 43 (1931), No. 8, pp. 661–679, figs. 6*).—The phenotypic expression of eight plant and head characters in the $F_1$ to $F_8$ generations of *A. ovata* × *T. dicoccum* (Black Winter emmer) is described in some detail from studies of the U. S. D. A. Bureau of Plant Industry. See also earlier notes (E. S. R., 55, p. 698; 63, p. 324).

Although a high degree of constancy was found in the later generations, the data showed that measurable and even marked departures from the $F_1$ type might occur. Indications were that while a form intermediate in general appearance to the two parents is maintained in all generations of Aegilops-emmer hybrids, the breeding behavior shows decidedly more variation than is expected in a fixed species. The chromosome complement of the plants did not appear to be fully balanced, and the gametes formed did not seem identical in constitution. Consequently sterility and variability resulted. No entirely true-breeding, fully fertile strain has been isolated from this cross.

**Some results of inbreeding on fecundity and on growth in sheep**, E. G. RITZMAN and C. B. DAVENPORT (*New Hampshire Sta. Tech. Bul. 47 (1931), pp. 27*).—In continuing the studies in sheep breeding previously noted (E. S. R., 50, p. 26), an analysis is reported of the influence of inbreeding. Southdown rams were crossed with Rambouillet ewes in producing the 76 $F_1$s. There were in the $F_2$ and $F_3$ generations, respectively, 92 and 38 individuals. An $F_4$ generation of 18 individuals was produced by mating $F_3$ ewes to $F_2$ and $F_3$ rams, and $F_2$ ewes to $F_3$ rams. There were also included in the studies 34 outcross individuals. Attempts were made to select the breeding animals in each generation on the basis of growth rate and size.

Both good and inferior animals occurred in all generations, but on the basis of averages some improvement was obtained over the $F_1$s as a result of the selection practiced. The measurements employed were the weights at 2, 4, and 12 months of age, chest circumference, trunk length, and a growth index obtained by adding the weight in ounces at 1 year to the chest circumference and trunk length in centimeters, and dividing by the mean for the $F_1$s. The successive generations of inbreeding showed practically no change in the number of young per litter.

The data were also analyzed on the basis of the families started by the 36 $F_1$ ewes. Specific characteristics were shown by the individual families, but only one was outstanding in exhibiting a high twinning tendency which persisted through the 3 generations of inbreeding, and the rate of growth index in this family was generally high.

Inbreeding brought out undesirable recessive characteristics in general, but by rigid selection it was possible to maintain the standard of fecundity and adult size expressed by the $F_1$ generation.

**[Studies on physiology of reproduction]**, F. F. MCKENZIE (*Missouri Sta. Bul. 300 (1931), pp. 47–49*).—The results of the following studies are briefly noted:

*The diagnosis of pregnancy in mares.*—Injections of urine from males into immature mice and rats produced no changes in the ovaries of the test animals, but positive results were obtained when blood serum was taken from mares pregnant for from 43 days to 5½ months. This serum also stimulated growth in the accessory genital organs of male mice.

*The anterior lobe of the pituitary in livestock breeding.*—Some favorable results from implantations of anterior pituitary lobes in weanling gilts and ewe lambs were obtained, but there were many difficulties in obtaining the fresh pituitaries uncontaminated with pus-forming organisms.

*The length of the period of heat, the oestrous cycle, and gestation period in mutton sheep.*—The average duration of 92 heat periods in Shropshire and Southdown ewes was about 23 hours, the average length of the cycle from the beginning of one oestrum to the beginning of the next oestrum was 16 days, and the length of the gestation period averaged 145.8 days.

*Anatomy of cryptorchid boars.*—A study of 10 cryptorchid boars showed that 5 were double cryptorchids, and only 1 failed to develop masculine characteristics. When this individual was killed at 13 months of age only one testicle was found, and it was located in the inguinal canal and had a weight of approximately 3 per cent of the weight of the normally descended testicle. In other cryptorchids undescended testicles were located in the abdomen, and their size was much reduced.

*Cryptorchidism in swine.*—A study of the occurrence of cryptorchidism in certain families indicated that this characteristic was inherited.

**The relation between the estrus producing hormone and a corpus luteum extract on the growth of the mammary gland, C. W. Turner and A. H. Frank** (*Missouri Sta. Bul. 300 (1931), pp. 61, 62*).—Although a crude extract of corpora lutea from the sow injected into castrated male and female rabbits induced neither additional growth of the ducts nor the pregnant type of development of the lobules of the mammary glands, the simultaneous injection of the extract and the oestrum-producing hormone into these animals induced development of both the ducts and the lobules strikingly similar to that occurring during pregnancy. Lactation, however, was not produced in these animals.

**A study of ova from the Fallopian tubes of dairy cows, with a genital history of the cows, F. W. Miller, W. W. Swett, C. G. Hartman, and W. H. Lewis** (*Jour. Agr. Research [U. S.], 43 (1931), No. 7, pp. 627–636, fig. 1*).—An account is given of the recovery of tubal ova from two cows, in cooperative studies between the department of embryology, Carnegie Institution of Washington, and the U. S. D. A. Bureau of Dairy Industry. A fertilized ovum in the 2-cell stage was recovered fom one cow 48 hours after breeding, while an unfertilized ovum was recovered from the Fallopian tube of the other cow 74 hours after mating to several young bulls. The dimensions of the fresh unfertilized ovum are given as 135 by 135.5μ inside the zona, and for each cell of the fertilized ovum as 103 by 67.5μ from one photograph, and 97 by 64.9 from another photograph. It is considered that these findings indicate that ovulation and fertilization may be completed within 48 hours after the appearance of oestrum in the cow, and that at least 74 hours are required for the tubal ovum to reach the uterus.

Another cow was killed three days after breeding, but apparently she did not ovulate.

**Correlation of cytoplasmic storage in germ cells and early stages of growth and development in domestic animals, M. J. Guthrie** (*Missouri Sta. Bul. 300 (1931), pp. 105, 106*).—A study of oocyte development in swine indicated that growth cycles were apparently sequential, although it could not be determined how much, if any, overlapping occurred. Mitochondria were found in the smallest oocytes of all classes of bony vertebrates studied, and in some, neutral fat was also present. In all cases neutral fat and pseudoyolk spheres were deposited as conspicuous growth began. Other types of cytoplasmic inclusions were observed, and it was considered that these inclusions were materials stored during increased assimilation or decreased dissimilation in cells.

## FIELD CROPS

**The importance of the shape of plots in field experimentation, B. G. Christidis** (*Jour. Agr. Sci. [England], 21 (1931), No. 1, pp. 14–37, figs. 4*).—Tests of the validity of certain theoretical considerations on the effect of shape of plats on soil heterogeneity were made with numerical data from the uniformity trials reported by Mercer and Hall (E. S. R., 26, p. 732), Lyon (E. S. R., 28, p. 537), Kiesselbach (E. S. R., 39, p. 829), Stephens and Vinall (E. S. R., 60, p. 735), and by E. D. Pearson and the author working at Cambridge University. The investigations suggested that, in order to reduce the effect of soil heterogeneity, the plats used should be as long and narrow as possible within the limits set by such practical considerations as convenience, competition (when acting), and the accurate measurement of width.

**The influence of systematic plot arrangement upon the estimate of error in field experiments,** O. Tedin (*Jour. Agr. Sci.* [*England*], *21* (*1931*), *No. 2, pp. 191–208, figs. 3*).—The effect of systematic plat distribution upon the estimate of error in a field plat experiment of 5 by 5 plats was studied on 91 blocks taken from 8 different uniformity trials, representing a wide variation in plat size and plat shape, crop, climate, and soil. The arrangements included 2 different knight's moves, 2 different diagonals, and 8 irregular arrangements. The use of systematic plans was shown to introduce a bias in the estimate of error of the experiment, the knight's move arrangement causing an overestimation and the diagonal an underestimation. One and the same arrangement appeared to have essentially the same effect upon the estimate of error under quite different conditions. It was demonstrated that the degree of variability within the 5 by 5 block has no influence on the effect of the arrangement upon the estimate of error, this holding true with both total variability and the variability within columns and rows. The influence of a certain arrangement upon the estimate of error was observed to be independent of the strength of the correlation within columns and rows. By means of two indexes calculated it is said to be possible to characterize an arrangement and to predict with fair probability whether it will lead to overestimation or underestimation of error.

**Studies in sampling technique: Cereal experiments, I–III** (*Jour. Agr. Sci.* [*England*], *21* (*1931*), *No. 2, pp. 366–371; pp. 372–375, pl. 1, figs. 2; 376–390, fig. 1*).—The studies are reported in three parts.

I. *Field technique*, A. R. Clapham.—The technic employed in harvesting four cereal experiments, comprising 210 plats each about 1/40 acre in area, by a sampling method noted earlier (E. S. R., 63, p. 824) is outlined. Three experiments with oats, barley, and wheat at Rothamsted were harvested later by large scale methods involving the use of a binder.

II. *A small-scale threshing and winnowing machine*, T. W. Simpson.—The machine constructed for rapidly handling the many small sheaves is described and illustrated.

III. *Results and discussion*, A. R. Clapham.—An analysis of the results showed that the sampling errors per plat lie between 5 and 6 per cent of the mean yield and are low enough for there to be little loss of information. The relative merits of large-scale and sampling methods are discussed with reference to the possibilities of dealing with many very small plats and of carrying out complex experiments on farms distant from the organizing station.

**On the influence of soil temperature on the germination interval of crops,** J. O. Irwin (*Jour. Agr. Sci.* [*England*], *21* (*1931*), *No. 2, pp. 241–250*).—Statistical examination at Rothamsted of data on the dates of planting and emergence of cereals and root crops grown during several years at a number of experimental centers in Great Britain showed that in all except a few cases there was no varietal difference in germination interval as measured by the interval between sowing and appearance above ground. The germination interval for winter wheat and oats was observed to be shorter by from 1.5 to 2 days for each increase of 1° F. in 4-in. or 8-in. soil temperature. For spring oats and barley the corresponding shortening was about 1 day. Swedes clearly exhibited no correlation between germination interval and soil temperature.

**[Field crops experiments in Missouri, 1929–30],** W. R. Tascher, L. J. Stadler, R. T. Kirkpatrick, C. A. Helm, B. M. King, T. J. Talbert, and J. T. Quinn (*Missouri Sta. Bul. 300* (*1931*), *pp. 72, 75–77, 78–81, 88, 89*).—Agronomic investigations reviewed again (E. S. R., 63, p. 727) included breeding work and variety tests with corn, wheat, oats, barley, and soybeans; spacing, fertilizer, and variey tests with cotton (E. S. R., 65, p. 330) and potatoes; planting tests with kafir; and treatments for seed potatoes.

**[Plant breeding in New South Wales, 1927–28, 1928–29, 1929–30]**, H. Wenholz (*N. S. Wales Dept. Agr., Sci. Bul. 32 (1928), pp. 13; 35 (1930), pp. 42, figs. 5; 36 (1931), pp. 46, figs. 8*).—The progress of breeding work at different experimental centers in the State during the years indicated is reviewed for wheat, oats, barley, rye, corn, rice, sorgo, Sudan grass, broomcorn, flax, potatoes, sweetpotatoes, tobacco, alfalfa, and miscellaneous summer and winter legumes, grasses, and pasture plants; tomatoes, peas, beans, lettuce, onions, beets, and cucurbits; and apples, pears, peaches, plums, apricots, nectarines, cherries, grapes, strawberries, and oranges.

**Artificial reseeding on western mountain range lands**, C. L. Forsling and W. A. Dayton (*U. S. Dept. Agr. Circ. 178 (1931), pp. 48, pls. 2, figs. 5*).—Replacing Department Bulletin 4 (E. S. R., 30, p. 35), this circular brings together the best available information on the conditions under which artificial reseeding of range may be justified; cultivated, introduced, and native species that may give best results; and the methods promising the greatest success.

**An introduction to the study of the South African grasses, with notes on their structure, distribution, cultivation, etc.**, E. P. Phillips (*[Johannesburg]: So. Africa Cent. News Agency, 1931, pp. 224, pls. 121, figs. 5*).—The tribes and genera of South African grasses are described from available materials and are classified with determinative keys. The book also includes information on the literature, distribution, common names, and agricultural and economic value of grasses in South Africa.

**Studies in Indian barleys, I, II** (*Indian Jour. Agr. Sci., 1 (1931), No. 1, pp. 58–89, pls. 7, figs. 6; 90–108, pls. 3, fig. 1*).—Two studies are reported.

I. *Classification of types isolated at Pusa*, R. D. Bose.—Pure types of barley isolated from samples from important barley districts in India are described and classified, with comment on their economic worth, barley production in India, and the basis of barley classification.

II. *The root-system*, R. D. Bose and P. D. Dixit.—The root systems of the 24 types of barley described above and 6 others were studied when the plants were mature. According to the character of its shallow and deep roots and the direction of the shallow roots, each type could be classed as mesophytic, with shallow roots well developed and given off at right angles to the tillers, with deep roots comparatively poor: semimesophytic, with shallow roots poorer than the first type and deep roots poor but better than the first in number and branching; semixerophytic, with shallow roots well developed given off obliquely downwards and more and longer deep roots than the first two types; or as xerophytic, with a poor shallow root system and a deep root system generally deep penetrating and well formed.

Shallow-rooted types are earlier in maturity and date of flowering and are erect or semierect in early habit, while the deep-rooted types are late and tend to be spreading or bushy in early growth. No definite relation was noted between the height of the tops and the depth of the roots in different types. Shallow-rooted types were among the highest yielders at Pusa, but the deep-rooted types with poor shallow roots did not do well. Shallow-rooted types with the shallow roots spreading at right angles to the tillers generally belong to localities with abundant soil moisture, while deep-rooted types with poorly developed shallow roots which go out at an obtuse angle to the tillers originated from seed brought from drier sections.

**Adaptability of red clovers from different regions to Kentucky, E. N. Fergus** (*Kentucky Sta. Bul. 318 (1931), pp. 217–246, figs. 15*).—Comparative trials of strains of red clover (E. S. R., 66, p. 130), in cooperation with the U. S. Department of Agriculture at the station from 1922 to 1925, inclusive, proved that many kinds of red clover, including those from Europe, Chile, and Northwestern States of the United States, were not reliable in Kentucky. More extensive tests from 1926 to 1930, also at the substations, showed Italian clover to be of little value, never making a crop the second year. Compared as to yield with the best Kentucky clovers, other European clovers were worth one-fourth as much, clover from Northwestern States one-third as much, and northern clovers a little more than half as much. Of the sorts producing both first and second crops the second year clovers from Ohio, Indiana, Illinois, and Missouri averaged in value about two-thirds and southern clovers about four-fifths as much as the best Kentucky clovers. Kentucky clovers also had several degrees of merit. The most valuable strains for the State, such as Nos. 101 and 107, rarely failed to produce good crops the second year if properly cultivated and managed. The results emphasized that only clovers that have been tested and are known to be adapted to local conditions should be used.

**Source and care of cotton planting seed in relation to the length of staple, J. H. Moore and J. A. Shanklin** (*North Carolina Sta. Tech. Bul. 42 (1931), pp. 31, figs. 14*).—The principal conclusions in this study made in cooperation with the U. S. Department of Agriculture have been noted from another source (E. S. R., 64, p. 832). Comparison of cotton grade and staple estimates for the United States and North Carolina for the 1928, 1929, and 1930 crops indicated that the staple of the United States had shown no improvement, but that the staple had improved considerably in North Carolina. This improvement was probably largely due to the planting of seed from improved varieties which usually produced a staple of from $\frac{15}{16}$ to $1\frac{1}{16}$ in.

**Some factors concerning earliness in cotton, C. A. Ludwig** (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 7, pp. 637–659, fig. 1*).—The square-maturation periods of five upland cotton varieties studied by the South Carolina Experiment Station (E. S. R., 52, p. 531) ranged from 22 to 22.8 days in 1923 and 25 to 26.3 days in 1924. Varietal differences in boll periods were larger and fairly consistent for the two years, a result in harmony with findings of others and indicating that relative length of boll period depends upon hereditary characters. Compared with Egyptian and sea island cottons, the upland type probably has a shorter square period and both upland and Asiatic cottons shorter boll periods. Neither the quantity of sodium nitrate nor the time of its application, nor variations in spacing had much effect on either the square period or the boll period. Compared with no cultivation, the usual or a lengthened cultivation period prolonged square and boll periods.

Stripping forms from the plant did not perceptibly affect the square period, although there was an apparent lengthening of the boll period as the date of stripping was delayed. Stripped plants grew taller, produced more late blooms and bolls, matured more of the late set bolls, and remained green longer in the autumn than the unstripped plants.

Bolls of Cleveland and Webber 49–6, which required 45 days or longer to open, reached their full size in about 18 days (E. S. R., 50, p. 638). The resistance to puncture of their boll walls increased from blooming almost to maturity, and a very great increase occurring at the opening of the boll was due to the drying out and hardening of the boll wall. The wall increased in thickness for a time and then became thinner, even while the resistance to puncture continued to increase.

**Methods of estimating cotton fiber maturity**, R. S. Hawkins (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 8, pp. 733–742, figs. 6*).—Some of the factors responsible for the presence of abnormal quantities of immature fibers in cotton, and methods for evaluating cotton for maturity of the fibers were studied by the Arizona Experiment Station. All determinations except varietal tests were made with Acala cotton.

The fluffiness in the cotton boll appeared indicative of the quantity of immature fibers present and usable to a certain extent in appraising cotton as to immaturity of fibers while it still remains unpicked. The color, plumpness, and maturity of a representative quantity of delinted seed also seemed to indicate the percentage of immature fibers borne by the seed. Dark-colored, plump, and well developed seed are correlated with a high percentage of mature fibers, and, conversely, light-colored, poorly developed seed are associated with a high percentage of immature fibers. Factors contributing to the production of high percentages of immature fibers included high concentrations of soil alkali, a comparatively low supply of soil moisture, and early frosts. The last picking usually contained the most immature fibers. Distinct varietal differences in fiber maturity evidently are common in varieties subject to the same environment.

**Certified seed potatoes**, R. A. Jehle (*Md. Univ.* [*Agr.*] *Ext. Bul. 57* (*1931*), *pp. 28, figs. 11*).—Information is given on the certification of seed potatoes in Maryland and some of the results obtained.

**A uniformity trial with irrigated broadcast rice**, L. Lord (*Jour. Agr. Sci.* [*England*], *21* (*1931*), *No. 1, pp. 178–188, fig. 1*).—A uniformity trial with irrigated broadcast rice at the Anuradhapura, Ceylon, Experiment Station showed large variation to exist within and between fields. Standard deviations decreased with increase in size of plats and varied from 20.1 per cent with 1/436-acre plats to 7.8 per cent with -acre plats. The decrease of the standard deviation was small with plats larger than 1/87 acre, the size considered most practicable for field trials. The influence of proximity to borders, irrigation channels, and drains on yields, also observed in Upper Burma (E. S. R., 50, p. 832), is discussed, and methods of reducing errors due to this cause are suggested. The use of a Latin square extending over more than one field did not produce a more accurate experiment than the use of randomized blocks, which appeared to be the more suitable method for fertilizer and other trials under rice growing conditions.

**Soybean culture and varieties**, M. M. Hoover, T. C. McIlvaine, and R. J. Garber (*West Virginia Sta. Bul. 243* (*1931*), *pp. 16, fig. 1*).—Variety and cultural experiments with soybeans are reviewed, with directions for growing the crop in West Virginia. See also an earlier report (E. S. R., 63, p. 35).

Good yields of both hay and seed were made at the station by the Haberlandt, Peking, Peking Selection I–21–7, Wilson, and Hamilton varieties, and at Lakin by Haberlandt, Hamilton, Sherwood, Virginia, and Peking Selection I–21–7. The choice of a variety evidently would be governed by its intended use, whether for hay or for seed.

Yields of air-dry hay from three varieties grown at Lakin during five years were fairly consistent in favor of seeding in close drills instead of cultivated rows. Seasonal differences seemed to affect seed yields considerably.

**Growing and handling sweet potatoes in California**, D. R. Porter (*Calif. Agr. Col. Ext. Circ. 55* (*1931*), *pp. 32, figs. 12*).—Cultural and field practices and storage methods are outlined for sweetpotatoes in California, with notes on varieties, insects, and diseases.

**Some breeding investigations on toria (Brassica napus L. var. dichotoma Prain) and sarson (Brassica campestris L. var. sarson Prain)**, A. Moham-

MAD, R. D. SINGH, and Z. ALAM (*Indian Jour. Agr. Sci., 1 (1931), No. 1, pp. 109–136, pls. 2, fig. 1*).—Toria and sarson are said to be by far the most important oil seed plants of the Punjab. In both the floral mechanism provides few chances for natural selfing. Under bags, on an average of 4 years, only 12.1 and 20.1 per cent, respectively, of toria and sarson flowers formed pods, and many of these pods contained very few normal seed. Production of normal seed under bags was about $\frac{1}{40}$ and $\frac{1}{27}$, respectively, of that in free-flowering branches open to insects. The yellow-seeded form of sarson, however, sets seed fairly well under bags. Artificially selfing toria and brown-seeded sarson by hand pollination hardly increased the number of normal seeds per pod, but more pods were set. The high amount of self-sterility prevailing in the two plants seemed due to internal as well as external causes. Yields of toria are adversely affected by long spells of cloudy, damp weather if they occur in November. Under such conditions insects fail to come out to pollinate the flowers. Evidence was obtained that strict self-fertilization would lead to loss of vigor in sarson. In both plants red seeds weighed less than black seeds. Sarson and toria cross readily with each other and with turnip.

**The influence of manurial treatment on the baking quality of English wheat.—I, A quality study of the Rothamsted Broadbalk wheats,** E. A. FISHER and C. R. JONES (*Jour. Agr. Sci. [England], 21 (1931), No. 3, pp. 574–594, pls. 2*).—Milling and baking tests were made on wheat samples grown on Broadbalk Field at Rothamsted in 1926, 1927, 1928, and 1929.

The nitrogen contents of the wheats were found to be increased consistently only by the heaviest nitrogenous treatments. Increased protein content, however, was not necessarily accompanied by improved baking quality. The order of the quality of the various plats as revealed by baking tests was essentially different every year. No plat maintained either a high or low relative position, and no one plat retained an unaltered quality while others fluctuated.

Among the tentative conclusions drawn was that the presence or absence of given basic constituents or of phosphates in the fertilizer had no discernible effect upon the quality of the grain. In years when nitrate fertilizer produced good results the ammonium salts gave poor effects, and vice versa. Results on the untreated plat tended to parallel those on the ammonium plat. The manured plat tended to associate with the plat receiving the lightest ammonia dressing.

The Broadbalk flours appeared to vary in their response to heat treatment. Where protein content was increased as a result of fertilizer treatment but the flour was weak from the baking viewpoint improvement followed the physical treatment, whereas if the protein was increased in quantity and was satisfactory in quality or when low had not been increased in amount the flour might not respond.

Flours from wheats grown in Rothamsted during 1929 to test the effect of nitrogenous fertilizer (in ammonium salts) at early and late stages of plant development, respectively, revealed no significant increase in nitrogen content due to fertilizer treatment.

**Investigation on yield in the cereals, Victoria.—I, Census studies 1927–9,** H. C. FORSTER and A. J. VASEY (*Jour. Agr. Sci. [England], 21 (1931), No. 3, pp. 391–409, figs. 2*).—Observations were made on the development of crops of different wheat varieties grown in four districts of Victoria, using a method based on that of Engledow (E. S. R., 56, p. 227) by taking counts on plants of different foot length samples distributed systematically over the areas studied. The values determined were those comprising yield, viz, numbers of plants, spikes per plant, number of grains per spike, and average weight of grain.

Comparison of the data with those from English crops (E. S. R., 63, p. 437) revealed important differences in the population factor (number of plants). Climatic conditions in the Victorian wheat belt require that the rates of seeding and fertilizer should be restricted so that the early growth produced may be sustained to harvest under average rainfall conditions. Tillering and spike production showed typical variations with spacing, fertilization, soil, and season. The values per plant actually differed little from the English data.

Studies of plant behavior in varieties showed that the current tendency in plant breeding in Victoria was away from the original high-tillering sappy varieties to a low-tillering and sturdier type of growth better able to endure drought. The values for percentage survival of tillers to heads were a good indication of drought resistance, and all new wheats giving promise in yield trials showed an increase in this criterion. Head size showed a significant decrease in number of grains per spike from the English crop values and demonstrated the small spike produced in Victoria, although the average grain yields compared favorably with the English data.

Counts on plats variously treated with superphosphate revealed that it increases the density of crop in both numbers of plants and spike production per plant and also increases size of spike very materially. Nitrogenous top-dressing did not appear to favor wheat in the general wheat belt, since it encouraged a type of growth not resistant to drought.

**Seed,** H. Pieper (*Das Saatgut. Berlin: Paul Parey, 1930, pp. [5]+267, pl. [1], figs. [42]*).—This practical handbook, intended for farmers, agricultural organizations and advisers, and seedsmen, discusses the quality characters of field crops seed, the appraisal of seed of the several crops, preparation of seed and practices involved, and methods and organizations for guaranteeing and distributing pure seed.

**Results of seed tests for 1931,** B. G. Sanborn and L. J. Higgins (*New Hampshire Sta. Bul. 258 (1931), pp. 18*).—The percentages of purity and germination are tabulated for 385 official samples of field crops seed collected from dealers in New Hampshire during the year ended June 30, 1931.

## HORTICULTURE

**[Horticultural investigations at the Missouri Station]** (*Missouri Sta. Bul. 300 (1931), pp. 85–88, 89–91*).—Analyses by A. E. Murneek of 18-year-old apple trees of three varieties showed a large part of the nitrogen of the leaves to be reabsorbed prior to abscission. This nitrogen was deposited in the twigs and spurs and later removed to older tissues. With carbohydrates only a small percentage was removed from the leaves before abscission. On the approach of dormancy some carbohydrate was translocated from the twigs to older wood, and all parts of the tree showed a loss in starch with a corresponding increase in total sugars. An apple tree weighing 1,000 lbs. contained a total amount of nitrogen equivalent to 13 lbs. of nitrate of soda, of which 2.5 lbs. were in the leaves, 3 lbs. in the roots, and most of the balance in the older branches. Of 200 lbs. of total available carbohydrate, 25 per cent was in the roots and 75 per cent in the top. Hemicellulose was distributed in the same ratio, but with starch more than half was in the roots, which also showed a relatively high concentration of sugar. Rapidly growing trees had comparatively more nitrogen and carbohydrates in the top than in the roots.

As determined by T. J. Talbert and H. G. Swartwout, dry lime-sulfur 4 lbs. per 50 gal. of water was practically equal to the liquid lime-sulfur in the control of apple scab and caused less russeting of fruits. Five applications proved but little better than four in reducing scab infection. The use of a 1–1–50 Bordeaux mixture increased the percentage of russeted fruits beyond that of either lime-sulfur treatment. The finish of the fruits in the dry lime-sulfur plat was best of all treatments. As concerns the relative values of sprays and dusts, it is concluded that where disease or insects are serious spraying is more effective. Bordeaux mixture not only reduced the size of cherries but left an undesirable residue on the ripe fruit. Except in seasons favorable to black rot, ammoniacal copper carbonate applied to grapes after July 1 proved a good substitute for Bordeaux mixture, and unless berry moths are prevalent it is suggested that no arsenate be used after July 1. Spreaders were not found justifiable in apple and peach spraying. Oil sprays applied in the dormant season over a period of years caused no accumulative injury. Used as a delayed dormant treatment, oil sprays containing 2 per cent of oil were safely used without material injury up to the cluster bud stage. Evidence was found that oil sprays must be used cautiously as a substitute for arsenate of lead.

Cross- and self-pollination studies were conducted by Murneek with several apple varieties. Self-pollination gave a low percentage set of flowers, and Ben Davis, Jonathan, and Delicious were the best pollinizers. Of three and possibly four drops of immature fruits the first was the most pronounced. Self-pollinated flowers dropped shortly after blooming in one large wave, whereas cross-pollinated fruits persisted longer, the first abscission being of an irregular nature often considerably drawn out. Dropping was a varietal characteristic little influenced by the pollen parent. Self-pollination resulted in fewer fruits containing only about one-half as many seeds as crossed fruits but with little difference in the average weight of the fruits.

As determined by Talbert and Murneek, cleft grafting was the best method for top-working black walnuts, and about five years were required to convert a seedling into an improved variety. In the pecan and hickory budding gave the best results. The flowers of the native hazels *Corylus americana* and *C. rostrata* and some of their hybrids survived a winter that killed the flowers of improved forms. No injury was caused to the vegetative parts of any of the filberts.

In tests by J. T. Quinn of various selections and varieties of tomatoes for resistance to wilt (*Fusarium lycopersici*) Marglobe was outstanding, and two small-fruited English varieties were promising. No difference was seen between tomatoes in respect to susceptibility to *Cladosporium fulvum*.

Cantaloupe tests conducted by Quinn showed no difference in type or vigor of plants from seed obtained from different sources. Lake Champlain was the earliest ripening variety in the test. Weather conditions usually favorable to *F. conglutinans* increased the percentage of infection in cabbage strains selected for resistance. Late varieties appeared more resistant than early types.

Attempts by H. D. Hooker and Murneek to induce by pruning and fertilization annual fruiting in the York Imperial apple were partially successful, but whether the changed fruiting habit may be permanently established is questioned in view of the results.

Studies in strawberry nutrition by Swartwout and J. H. Long are briefly reported. Summer applications of superphosphate with or without nitrogen did not stimulate runner production, whereas a combination of phosphorus and potassium or any combination of fertilizer used at the 400-lb. rate in spring or summer caused a great increase in runners. A 1,200-lb. application of fertilizer in the spring was almost disastrous, but was less harmful when potassium was included. Summer fertilizers increased the number of flower clusters per plant, but no treatment increased the number of blooms per cluster. A spring application of 15–30–15 fertilizer greatly increased the number of flower clusters per plant, and a spring application of phosphorus and nitrogen caused the largest increase in percentage set. A 160-lb. per acre application of 15–30–15 fertilizer in summer and again in spring caused more blooms to form and more fruits to mature than any other treatment. Every treatment was beneficial, phosphorus alone at 400 lbs. per acre doubling and the 15–30–15 mixture trebling the yield. No effect was found by Swartwout from applications of either ammonium sulfate or of stable manure to bearing Concord and Moore Early grapes. Analyses showed the same total amounts of nitrogen in the fertilized and control vines both in winter and in spring. Nitrogen was highest in the roots and lowest in the base of the trunk.

Evidence was obtained by Murneek and E. J. Gildehaus that harmful effects, such as the marginal burning of leaves, that can be induced in dwarf apples by large applications of nitrogen may be obviated by increasing the amount of potassium applied. According to Murneek the low temperature of 1929–30 killed the blooms on all varieties of peaches and injured the twigs and branches of the more tender sorts. Marquette, Vainqueur, Wilma, and Kalamazoo successfully withstood 15° F. below zero.

**Recording apparatus for horticultural experiments, including automatic counting devices, W. S. Rogers** (*East Malling [Kent] Research Sta. Ann. Rpt., 16–18 (1928–1930), pt. 2, pp. 65–73, pls. 4, figs. 3*).—Descriptions are given of various devices found helpful at the East Malling Research Station in taking horticultural records.

**Studies in lettuce seedbed irrigation under high temperature conditions, M. F. Wharton and C. Hobart** (*Arizona Sta. Tech. Bul. 33 (1931), pp. 283–303, figs. 11*).—High day temperatures prevailing during the period of seeding the late crop of lettuce in the Salt River Valley are said to be unfavorable to germination, despite ample water supplied by irrigation. Night soil temperatures, on the other hand, were within the range favorable to germination. Studies of the effects of different irrigation practices on soil temperature showed that continual irrigation had little direct influence on soil temperature during hot weather, as the cooling effect of the water was lost by the time it reached the plant row. An irrigation program that insured a continuous moist soil surface with a minimum amount of water was found most desirable in producing favorable temperatures and soil conditions for germination and for seedling growth. Heavy irrigation tended toward puddling and cracking of the soil, and excess moisture retarded root development and growth by impairing aeration. The cooling effect of evaporation was found proportional to the evaporation rate and wind movement.

Vigor of seed was found an important factor in germination under favorable conditions, the plants from strong seed being able to overcome unfavorable soil conditions such as prevented growth of plants from weak seed. The germination of strong lettuce seed was adversely affected by poor aeration but not to the extent of a commercial loss such as occurred with weak seed.

**The influence of nutritive conditions of seeds and cuttings upon the development of the roots, M. E. Reid** (*9. Internatl. Hort. Cong., London, 1930, Rpt. and Proc., pp. 165–169; Fr., Ger. abs., p. 165*).—Citing the results of her own experiments and of others, the author presents evidence that both the external and internal nutrient conditions profoundly affect the ability of seedlings and cuttings to produce roots. The amount of synthesized carbohydrate is important, though its function is not completely understood. It is considered possible that in addition to furnishing material for respiration and cell growth carbohydrates may assist in the formation of other types of nutritive compounds.

**Oxygen requirements for root growth of cuttings in water,** P. W. Zimmermann (*9. Internatl. Hort. Cong., London, 1930, Rpt. and Proc., pp. 170–186, figs. 8; Fr., Ger. abs., p. 170*).—At the Boyce Thompson Institute for Plant Research the oxygen content of water was found to exert a profound influence on the rooting of cuttings in water cultures. Salvia cuttings in water with a low oxygen content rooted near the surface rather than at the base. With a lack of oxygen Salvia cuttings wilted, even though the stems were immersed in 15 in. of water, whereas aerated cuttings remained in good condition and formed roots at the base. Comparable results were recorded for the tomato. Dorothy Perkins rose cuttings formed both callus and roots in 3 in. of water and not at all in 8 in. A thin layer of paraffin oil on the water prevented the absorption of oxygen from the air and hastened the death of cuttings in vessels wrapped with black paper. However, under conditions of intense light the photosynthetic activity of the green stems apparently supplied sufficient oxygen.

Willow stems with a marked absence of polarity rooted best at the base when in aerated water. Hypertrophied lenticels were largest on willow cuttings in nonaerated water and not present at all in aerated water. Apparently all tissues in a cutting were not affected in the same way by variations in the oxygen supply.

Species differed in their oxygen requirements, tomato, Salvia, and ivy having a high and willow a very low oxygen need. When sufficient oxygen was supplied more did not add to the beneficial results. Oxidizing agents, such as hydrogen peroxide and potassium permanganate, increased rooting but did not equal aeration.

**Varieties grown on own roots,** N. Esbjerg (*9. Internatl. Hort. Cong., London, 1930, Rpt. and Proc., pp. 197–217, figs. 18; Fr., Ger. abs., p. 197*).—Stating that apples, especially certain varieties, are frequently grown on their own roots in Denmark and to a lesser degree also plums, pears, and cherries, the author cites the results of recent studies at Blangstedgaard which show that certain apple varieties grow and fruit as well on their own roots as when grafted. Ringing layered apples by means of a copper wire tied tightly about the base greatly increased the percentage of rooting.

Thirteen of 130 lots of softwood cuttings of plum cuttings planted on June 1, 1929, rooted more than 60 per cent, and 42 of the lots failed to root at all. In the last group were such well known varieties as Burbank, Giant, Jefferson, Orleans, Reine Claude, and Transparent. Soaking root cuttings in water for 72 hours prior to planting increased the percentage of rooting in Cox Pomona and Wealthy and was just about as effective as sugar and glycerine solutions. Root cuttings placed in hotbeds grew better than those in coldframes or in the open soil.

**Textbook of pomology,** F. Kobel (*Lehrbuch des Obstbaus. Berlin: Julius Springer, 1931, pp. VIII+274, figs. 63*).—From the physiological standpoint the author presents a comprehensive discussion of various phases of promology, including nutrition, flower formation, development of the fruit, sterility and its causes, the relationship between vegetative growth and fruitfulness, the breeding of new varieties, etc.

**The relation of organic matter to fruit growing,** R. C. Collison (*N. Y. State Hort. Soc. Proc., 76 (1931), pp. 102–110*).—A résumé is given of the present status of knowledge, suggesting certain modifications in the present plans of soil management, namely, the earlier planting of cover crops and the use of a complete fertilizer because of its stimulating effect on the cover crop and thereby increasing organic matter.

**The University Fruit Farm at Union, Nebraska,** C. C. Wiggans (*Nebraska Sta. Circ. 43 (1931), pp. 17, figs. 7*).—Discussing the establishment of the fruit farm and listing the species and varieties under test, the author briefly outlines the experimental projects under way.

**The chemistry of the rootstock-scion effect, I, II,** W. A. Roach (*East Malling [Kent] Research Sta. Ann. Rpt., 16–18 (1928–1930), pt. 2, pp. 101–110*).—Two studies are noted.

I. *The elements absorbed from the soil* (pp. 101–104).—A spectrographic examination of the ashes of various parts of 2-year budded Lane Prince Albert apple trees worked on Malling IX and XII revealed the presence of potassium, calcium, magnesium, sodium, phosphorus, iron, aluminum, manganese, barium, strontium, lithium, copper, lead, titanium, vanadium, silicon, nickel, chromium, tin, molybdenum, and silver. Most of these elements were distributed throughout the whole plant, but lead was restricted to the roots and molybdenum was absent from the scion in rootstock IX and from the entire tree in XII.

II. *Methods for testing the effects of substances in solution on fruit trees* (pp. 105–110).—As nothing is known of the function of many of the 21 elements found in apple tissues, attempts were made to introduce certain of these directly into the tree to study their effect. When the cut end of a small side shoot near the base of the tree was immersed in a solution, the liquid was absorbed but distributed unevenly in the tree. Through the cut end of the terminal shoot of a cordon grown apple, permeation of every leaf in the top half of the tree was secured. Damage from toxic solutions decreased from the top downward. Absorption through a side branch of a rootstock led to a more uniform distribution if the plant was lifted rather than growing normally. Lithium sulfate permeated more freely than either potassium molybdate or magnesium chloride.

**Root stocks from seeds of known parents,** C. G. Dahl (*9. Internatl. Hort. Cong., London, 1930, Rpt. and Proc., pp. 141–149, figs. 7; Fr., Ger. abs., p. 141*).—Attempts at Alnarp, Sweden, to grow rootstocks from open-pollinated seed of known apple varieties revealed great differences in the number of seed produced by varieties, in the viability of the seed, and in the growth of the resulting seedlings. Large percentages of Gravenstein, Ribston, Boskoop, and Swedish varieties died during the first summer. On the other hand, Reinette Ananas, Boiken, Bismark, and certain other seedling lots displayed excellent vigor. During the first winter mortality greatly increased in the weak lots to the extent of completely eliminating certain lines.

After grading into four sizes, seedlings of several of the lots were propagated to Cox Pomona. Records taken a few years later showed the best trees on seedlings of Reinette Ananas, King of Pippins, Akero, and Bismarck. The fact that strong growing apple varieties often yield seedlings of very low vitality is attributed to abnormalities in their genetic make-up; for example, a supernormal number of chromosomes.

**Course of growth in an apple stock during the maiden year,** M. C. Vyvyan (*East Malling [Kent] Research Sta. Ann. Rpt., 16–18 (1928–1930), pt. 2, pp. 85–97, figs. 2*).—Using shoots of a clonal apple stock, Malling XIII, taken from a stool bed, it was found that during the period April to October total weight, including leaves, more than doubled, the increases being approximately proportional to the weights at planting. Rate of increase in leaf weight decreased progressively during summer, spur leaves ceasing first. The dry weight of roots formed before November was greater than that of the leaves. Roots lost in dry weight during the winter of 1929–30, an exceptionally wet season. Active new root formation was observed coincident with bud opening.

**Further experience with the pollination problem,** L. H. MacDaniels (*N. Y. State Hort. Soc. Proc., 76 (1931), pp. 32–37*).—A discussion of various factors, such as temperature, weather, pollinizers, duration of the blooming period, and bees, that are concerned in apple pollination. Under favorable conditions the introduction of bees and bouquets of compatible flowers into a McIntosh orchard at Morton, N. Y., increased the average yield per tree to 11.3 bu., whereas previous averages had never exceeded from 2 to 3 bu. Furthermore, the yield was uniform and not localized along the border rows. In the same season negative results were secured from bees and bouquets in a Northern Spy orchard at Hilton because of rain and cold.

Additional data on the pollinating capacity of varieties indicated that Twenty-Ounce is markedly self-unfruitful but effectively pollinated by Oldenburg, Rhode Island, and Delicious. Tompkins King was fairly self-fruitful but benefited by pollination with Oldenburg or Twenty-Ounce. Ben Davis was somewhat self-unfruitful and satisfactorily pollinated by McIntosh, Rhode Island, or Oldenburg. Gano was not a satisfactory pollinizer for Ben Davis.

**The cold storage of apples,** C. West (*Jour. Min. Agr.* [*Gt. Brit.*], *38* (*1931*), *No. 6, pp. 585–593, pls. 2, figs. 3*).—Studies conducted at the Low-Temperature Research Station, Cambridge, England, are reported, in which an effort was made at the application of refrigeration to the preservation of English fruit. In addition, a summary is given of investigations conducted elsewhere. Some data also are given on the gas storage of apples, in which it is shown that this type of storage is particularly valuable for varieties of apples susceptible to low temperature breakdown. A list of 10 references to work bearing on the subject is included.

**Development and ripening of peaches as correlated with physical characteristics, chemical composition, and histological structure of the fruit flesh.—I, Physical measurements of growth and flesh texture in relation to the market and edible qualities of the fruit,** M. A. Blake, O. W. Davidson, R. M. Addoms, and G. T. Nightingale (*New Jersey Stas. Bul. 525* (*1931*), *pp. 35, figs. 12*).—As one of a series of related bulletins (E. S. R., 64, p. 139), this discusses the results of studies of the development of the fruit of strongly vegetative and weakly vegetative Elberta peach trees, the growth differences being obtained by regulating the supply of applied nitrogen. As indicative of a comparative growth a typical high-nitrogen tree made a total linear growth of 33,233 in. in 1929 and a low-nitrogen or high-carbohydrate tree only 5,828 in. The leaves of the high-nitrogen tree were larger, darker green, and more tender than those of the high-carbohydrate tree.

In general the growth of a peach fruit could be illustrated by a double S curve, being in the Elberta variety most rapid in late May and early June, almost ceasing during the pit hardening stage, then becoming quite rapid again, and finally decreasing just before complete maturity. The firmness of peach flesh varied inversely as the rate of growth until the shipping ripe stage. Softening in the ripening peach was correlated with a decrease in protopectin, cellulose, and thickness of the cell walls.

As related to the condition of the tree, fruit from the high-carbohydrate trees ripened earlier, developed higher color, was firmer in texture, contained more sugar throughout the season, and could be picked in a firmer condition than those of the high-nitrogen trees. Fruit of the high-nitrogen trees did not attain satisfactory color, even when allowed to become soft ripe on the tree.

**An experiment in the thinning of Victoria plums,** A. C. Painter (*East Malling* [*Kent*] *Research Sta. Ann. Rpt., 16–18* (*1928–1930*), *pt. 2, pp. 74–82*).—Plum trees bearing an exceptionally heavy crop were thinned and the results compared with comparable unthinned trees. Total yields were reduced greatly by thinning, but the net returns were materially increased. Heavy winds occurring during the fruiting season materially damaged the nonthinned trees, with only slight damage to the thinned.

**Some "rogue" varieties of black currants**, J. Amos (*East Malling [Kent] Research Sta. Ann. Rpt., 16–18 (1928–1930), pt. 2, pp. 46–51, pls. 3*).—Three worthless rogues received under the name of Baldwin Black are described and production records given.

**The cropping of raspberry varieties at East Malling**, N. H. Grubb (*East Malling [Kent] Research Sta. Ann. Rpt., 16–18 (1928–1930), pt. 2, pp. 32–45*).—Tests of 15 varieties of raspberries showed Baumforth A to be the most productive and Helston second, but neither was equal to Lloyd George as a general purpose fruit. The American varieties Cuthbert, Latham, and June were not at all satisfactory.

**Strawberry cultivation: Strain, time of planting, and de-blossoming**, W. S. Rogers (*East Malling [Kent] Research Sta. Ann. Rpt., 16–18 (1928–1930), pt. 2, pp. 52–64, pls. 2, figs. 3*).—Observations on three strains of Royal Sovereign strawberries showed them to vary considerably in appearance but without doubt to belong to the same variety. Selection to remove weak plants decreased the differences between the three strains, indicating that environment rather than genetic causes underlie the variability. Early autumn planting gave much more favorable results than winter or spring planting as concerned yield, runner formation, and general vigor. There was little difference between December and February except that the December plants produced more runners. Deflorating in the first year resulted in 6 per cent increase in plant diameter and 32 per cent in number of runners.

**Further evidence on the necessity of boron for health in citrus**, A. R. C. Haas and L. J. Klotz (*Bot. Gaz., 92 (1931), No. 1, pp. 94–100, figs. 6*).—Several years of use were required to remove the boron present in glass, enamel, and glazed receptacles to the degree that citrus cuttings supplied with boron-deficient nutrients would show symptoms of suffering. The omission of boron caused corky and split veins in the leaves, multiple buds, cessation of new growth, bulbous enlargement of root tips, and the eventual decay of much of the root system, all of which conditions were rapidly remedied upon adding boric acid sufficient to make a concentration of 0.1 to 0.2 part per million in the culture solution. Since the excess of sugar in the leaves rapidly disappeared following boron treatment, the authors surmise that the restoration of conducting tissue is a factor in the rapid recovery. Leaves from the boron-deficient plants showed a slightly greater diastatic activity than normal cultures, the ratio being 150:138.5 in sour orange and 131:120 in the case of Eureka lemon growing on rough lemon stock.

**Seed germination in roses** [trans. title], E. M. Calvino (*9. Internatl. Hort. Cong., London, 1930, Rpt. and Proc., pp. 150–153; Eng., Fr., Ger. abs. pp. 150, 151*).—In studies at the Floricultural Experiment Station at San Remo, Italy, the immersion of rose seeds for 1 hour in a proprietary organic mercury compound increased germination by 33 per cent over untreated seed. Longer immersion, 6 hours, decreased the beneficial result. Immersion in water at 16° C. (60.8° F.) for 6 hours increased germination by 16 per cent and also hastened germination. Storage of seeds for 16 days at 0° hastened their germination by 1 month. The stage of maturity of the hips influenced germination to a certain extent, that of seed from green, yellowish, orange, and fully colored hips being 26.6, 26.8, 30.5, and 41.6 per cent, respectively.

**Commercial economic poisons commonly known as fungicides and insecticides**, R. H. Robinson and C. F. Whitaker (*Oregon Sta. Circ. 106 (1931), pp. 22*).—The results are herein presented of the analyses of various spray materials collected according to the provisions of the Oregon economic poison

## FORESTRY

**Forest mensuration,** E. G. Mason (*Corvallis, Oreg.: Author, 1931, pp. [10]+252, figs. 23*).—Prepared in mimeographed form, this text discusses the methods of determining the volume of logs and of timber stands and of measuring the growth and estimating the prospective yield of trees.

**Forest mapping,** E. G. Mason (*Corvallis, Oreg.: Author, 1931, pp.* [5]+85, *figs. 24*).—In this mimeographed manual the principles and practices of land surveying and forest mapping are discussed in detail.

**The identification of the pines of the United States, native and introduced, by needle structure,** W. M. Harlow (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 32 (1931), pp. 21, pls. 19*).—Beginning with a brief discussion of the general morphology and anatomy of pine needles, the author presents a key for the pines studied based on needle structure. Photomicrographs of needle cross sections appear in the appendix.

**Hastening the germination of western pine seeds,** G. R. Johnstone and T. S. Clare (*Jour. Forestry, 29 (1931), No. 6, pp. 895–906, figs. 2*).—The exposure of seeds of *Pinus torreyana, P. coulteri, P. sabiniana, P. cembroides* var. *monophylla*, and *P. tuberculata* to the moisture and temperature of melting ice hastened and increased the final germination. The optimum length of treatment differed with the species, being shortest (25 days) in *P. torreyana* and longest in *P. coulteri*, the difference being apparently correlated with the environments under which the species grow. The time of year when treated was also a factor, 15 days being the optimum for October-treated *P. tuberculata* seed and 35 days for samples of the same seed treated some 2 months later. It is suggested, however, that the differences may have been due to changes in the age.

**Recovery of western yellow pine seedlings from injury by grazing animals,** G. A. Pearson (*Jour. Forestry, 29 (1931), No. 6, pp. 876–894, figs. 10*).—Records taken by the U. S. D. A. Southwestern Forest and Range Experiment Station over a long period of years on the mortality and survival of seedlings injurd by grazing animals showed a remarkable ability of western yellow pine seedlings to recover. However, in the case of seedlings in their first and second years browsing by sheep or cattle was exceedingly hazardous, to the extent of often completely destroying the young trees. After the third year danger was said to have been appreciably less, and when the seedlings were from 4 to 6 in. tall it was only under extreme grazing continued year after year that defoliation was likely to approach the danger point.

**Improvement in the production of oleoresin through lower chipping,** E. Gerry (*U. S. Dept. Agr., Tech. Bul. 262 (1931), pp. 24, pls. 6, figs. 6*).—During a 5-year test, from 1923 to 1927, on the Choctawhatchee National Forest, in Florida, as large yields of oleoresin were obtained from low faces, approximately ¼ in. in height, as from high faces, ½ to ¾ in. The potential yield from low faces was thus twice that of high faces, and, furthermore, the low faces yielded material of higher quality because of a higher proportion of dip as compared with a relatively large yield of scrape collected from high faces.

Possible degrade of butt lumber because of excessive pitch soaking or because of drying of the exposed surface, accompanied by attacks of insects and fungi, was reduced to a minimum by the use of the low faces. Using the small-sized hacks (Nos. 00, 0, and 1), low chipping was practiced without an appreciable increase in operating costs.

Microscopic studies of the wood and bark obtained at different heights from the test trees showed that the low chipped trees had wider rings of annual growth, better-developed summer wood, and markedly more abundant oleoresin-giving tissues immediately above the faces than did the high chipped trees. Low chipping reduced the waste of productive wood and maintained the potential oleoresin and wood-producing powers of the tree, facts deemed of great significance in the turpentining of second-growth timber where rapid healing following low chipping hastens the next working of the trees.

**Some Antarctic beeches,** H. F. Comber (*Gard. Chron., 3. ser., 90 (1931), Nos. 2340, pp. 348, 349, figs. 2; 2341, pp. 364–366, figs. 3*).—Descriptive material is presented upon a number of species of the genus Nothofagus.

**Ohio Forest News, [October, 1931]** (*Ohio Forest News [Ohio Sta.], No. 15 (1931), pp. 8, figs. 2*).—This number contains brief articles on forestry activities and forest pathology and lists 41 species of pine assembled in the forest arboretum at Wooster.

## DISEASES OF PLANTS

**[Plant pathology at the Missouri Station]** (*Missouri Sta. Bul. 300 (1931), pp. 56–58*).—Fusarial plant disease studies conducted by I. T. Scott included a determination of the H-ion equilibrium points for several organisms: *Fusarium discolor*, pH 5.3 to 5.5; *F. niveum*, pH 6.4 to 6.5; *F. vasinfectum*, pH 5.5; and *F. conglutinans*, pH 6.8 to 7.0. A minimum growth measured as dry weight of mycelium produced was obtained at about pH 7.0 when *F. conglutinans* was grown in nutrient solutions of different initial pH values. The growth corresponded quite closely to the equilibrium point reached when washed mycelial mats of the same fungus were placed in acidic or basic salt solutions. There was a definite correlation between growth at different H-ion concentrations and the equilibrium points obtained in salt solutions. There was a correlation between reaction and the toxicity of various dissociating topic agents.

Studies by C. M. Tucker of the genus Phytophthora included observations on 150 isolations, representing most of the known species occurring on important hosts in various parts of the world. Evidence was seen of the existence of biological strains in certain species. The inherent character of the protoplasm apparently was the factor enabling certain forms to survive winter temperatures in oatmeal agar cultures. Species varied widely in their ability to develop at higher temperatures, but different isolations of the same species behaved very similarly, indicating that temperature response is stable. The most valuable identification points were adaptability to certain media, type of antheridium, character of the sporangia, temperature relations, and, in a few species, the development of certain types of reproductive organs, size of oospores, and pathogenicity. About 20 species were deemed valid, and one new species, *P. drechsleri*, is described. A key was worked out.

Flag smut was found by Scott to be serious only in St. Louis County and to be well controlled by rotations and the use of smut resistant varieties. *Pythium arrhenomanes*, the causal organism of a seedling blight, was isolated from diseased corn roots obtained from sections of Missouri where hitherto unknown. Disinfection of corn seed with organic mercury dusts reduced infection in a Pythium-infected soil in the grenhouse. Liquids did not give control. Corrosive sublimate 1–1,000 did not control seedling blight in the greenhouse. The disease appeared more virulent under greenhouse conditions when used alone than when associated with *F. moniliforme* and *Gibberella saubinetii*.

**Mass infection with oat loose smut by a new method [trans. title],** Zade (*Pflanzebau, 5 (1928), No. 3–4, p. 43*).—The method consists in the subjection of the grain which is to be tested to a strong spore-containing spray, so as to insure the passage and lodgment of the spores between the glumes and the seed to be tested.

**Use of varietal immunity against fungus parasites as a distinguishing mark for wheat variety record** [trans. title], W. Rudorf (*Pflanzenbau, 5 (1928), No. 1–2, pp. 4, 5*).—Tabulations are given, with discussion, of the behavior records of 11 wheat varieties after subjection to infection by 12 physiological forms of wheat brown rust (*Puccinia triticina*).

**Rust biotypes as aids in determining variety and purity of wheats** [trans. title], A. Scheibe (*Pflanzenbau, 5 (1929), No. 17–18, pp. 263–267*).—Infection types XI, XIII, XIV, and XV were tested, each with 13 wheats, and the results are tabulated, with discussion.

**Parasitism of Gibberella saubinetii on corn seedlings,** N. L. Pearson (*Jour. Agr. Research [U. S.], 43 (1931), No. 7, pp. 569–596, figs. 10*).—In this cooperative study conducted by the Wisconsin Experiment Station and the Bureau of Plant Industry, U. S. D. A., it was observed that the fungus *G. saubinetii* usually enters the corn seedling through ruptures in the cortex produced by the emergence of adventitious roots or by rapid growth. Invasion was at first intercellular, later also intracellular. In passing from cell to cell, the fungus penetrates the cell wall by means of a fine filament, whose entrance is possibly facilitated by chemical action. Invasion was accompanied by an accumulation of dark-staining material in the walls and intercellular spaces of the host, the stains extending considerably beyond the limits of the fungus penetration. In extensively invaded areas this densely stainable material was somewhat less abundant, perhaps having been used as food by the fungus. Invasion sometimes caused a swelling of the cell walls, especially of those cells near the endodermis. The author believes that the endodermis of semiresistant corn may serve as a partial if not a complete barrier against fungus entrance. Callosities occur frequently on the walls of cells near the endodermis and in the hypodermal layers, and may possibly be a manifestation of a certain type of resistance.

A traumatotactic displacement of the nucleus was observed in cells bordering lesions and wounds in the cortex of the mesocotyl produced by root emergence or by needle pricks. An alteration in the distribution and amount of the stainable portions of the cytoplasm was observed in the cells adjacent to ruptures and lesions.

**Infection experiments with the cotton root-rot fungus, Phymatotrichum omnivorum,** D. C. Neal and G. T. Ratliffe (*Jour. Agr. Research [U. S.], 43 (1931), No. 8, pp. 681–691, figs. 3*).—Studies conducted in Texas by the Bureau of Plant Industry, U. S. D. A., yielded further evidence that the fungus *P. omnivorum* is the cause of the destructive root rot disease of cotton. Using as inoculum pure cultures of the fungus, cultures originating from sclerotia found in the soil, and sclerotia obtained in laboratory cultures, infections were produced in plants both in the greenhouse and in the field. Cultures from conidial mats did not, however, prove infective. Cultures varying in age, especially those in which sclerotia were present, showed no perceptible differences in virulence when the plants were inoculated. Many of the greenhouse inoculated plants failed to show symptoms, but when the roots were examined at the close of the experiment, several were found infected.

Several plants inoculated with infected roots in the field developed the disease, with some indication that the fungus on freshly infected roots is more virulent and capable of killing a greater number of plants than that on roots in which the infection has been of longer duration. Efforts to transmit the disease to new areas by means of soil cores taken from infected zones were unsuccessful in the very dry season of 1929.

**Seed-potato treatments in Florida from 1924 to 1929, L. O. Gratz** (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 136–146*).—Details and tabulations as presented, with discussion, are held to indicate the practical inadvisability at the present time of treating seed potatoes in Florida with formaldehyde, corrosive sublimate, or organic mercury compounds.

**Seed potato disinfection** [trans. title], H. Braun (*Pflanzenbau, 5 (1928), No. 11–12, pp. 161–177*).—This article contains a descriptive account, with tabulations, of varieties, fungicides, and conditions employed in the various disinfection tests with seed potatoes, which also embraced field factors.

The varieties reacted differently to the treatments. Tuber sensitivity to the treatments underwent no important change during the winter months, but apparently there was an increase of sensitivity in spring at the time of sprouting. It was not ascertained what factor caused that increase. The time of treatment has only a limited influence on its effect. Much higher concentrations could be borne by the tubers without injury in winter months than in spring. There were indications that increasing concentration of the liquid was not paralleled by increase of injury, though periodical changes became evident. Increase of seed tuber weight corresponded to increased production of single eyes, when measured in length and weight of the sprouts. Perishing of the sprouts appeared to be positively related on the one hand to the occurrence of heavy sprouting, on the other to the increase of sprouting due to the use of fungicidal steeping.

**Some preliminary experiments with Burgundy mixture in New Brunswick, D. J. MacLeod and J. K. Richardson** (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 154–160*).—"While the results obtained from these series of experiments are by no means conclusive, nevertheless, they suggest some practical possibilities in the use of Burgundy mixture in the control of foliage diseases of the potato such as early and late blight."

**Potato dusting and spraying experiments in Florida from 1924 to 1928, L. O. Gratz** (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 146–154*).—In discussing the results of experimentation during these five years, it is stated in general that where equivalent amounts of copper are applied, and where both operations are carefully and thoroughly executed, spraying and dusting may produce similar increases in yield, though spraying apparently controls late blight a little better than dusting, and it has some effect on early blight, while dusting has no control of the latter. In the Florida potato belt each operation requires the closest supervision. A disadvantage of dusting is that it should be restricted to the times when the vines are covered with moisture and when the wind is not blowing. Spray may be applied whenever the vines are dry.

**The situation as regards potato scurf** [trans. title], Schlumberger (*Pflanzenbau, 6 (1929), No. 2, pp. 33–39*).—A relation is suggested to exist between scurf and canker, and it is thought that a laboratory test would be comparatively easy.

**Combating potato scurf through varietal selection** [trans. title], K. Hauptfleisch (*Pflanzenbau, 6 (1930), No. 9, pp. 255–257*).—Along with canker (wart) and Phytophthora rot, potato scurf has an economic significance which goes beyond that of the unsightliness produced, as the food quality is also deteriorated. The cause, an Actinomycete, is to be found in many soils, in which also other factors may contribute. Certain soils and soil reactions favor particularly this condition. Varietal tests are tabulated.

**Virus diseases of potatoes** [trans. title], H. Reiling (*Pflanzenbau, 5 (1929), Nos. 17–18, pp. 267–273; 19–20, pp. 284–290*).—Historical, descriptive, and tabular information is given regarding variously named virus diseases of potato, with 28 bibliographical references.

**The effects of certain cultural practices on the transmission of virus diseases of the potato,** T. M. McCall (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 161–163*).—In the Red River Valley, northern Minnesota, spindle tuber and mosaics alone or in combination may be found on any one of the three potato seed stock varieties grown locally, namely, Early Ohio, Irish Cobbler, and Bliss Triumph, reducing yields by amounts ranging from a mere trace to 40 per cent or even more in case of very heavy infestation. The knife transmission tests with mosaics are not yet completed. The results thus far obtained with spindle tuber tend to show that it is transmitted by the cutting knife.

**Roguing and potato virus disease control,** J. E. Kotila (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 164–168*).—Experimentation begun in 1928 on roguing against potato virus diseases at East Lansing, Mich., is detailed. Areas showing also mild mosaics and leaf roll revealed after the first roguing and with sprayings employing nicotine sulfate only primary streak and primary leaf roll, but these diseases spread rapidly thereafter. This increase is explained in two ways. It is stated that the wild hosts bittersweet (*Solanum dulcamara*) and groundcherry (*Physalis grandiflora*) were found growing near and even in the field, and that some of the latter appeared to be affected with virus disease. Aphids also may have carried the virus from diseased to sound plants. Although nicotine sulfate was applied with each spray, not many aphids were killed, and it was supposed that the spray caused them to wander restlessly, as an unusual increase of the disease resulted.

**The relation between Phoma or crown rot in beet and soil reaction,** P. H. Gallagher (*[Irish Free State] Dept. Agr. Jour., 29 (1929), No. 1, pp. 63–74, figs. 6*).—In this section of a report on an investigation as to the relation of soil conditions to failures in the beet crop, 1928, it is stated that the results of this investigation justify the general inference that Phoma is a serious menace on soils of pH 8 or over. Two exceptional cases may be explained by facts which are stated. It is concluded, therefore, that if in beet cultivation the soil reaction can be kept below pH 8, serious damage to the crop due to Phoma is not likely to occur.

In this investigation, values as high as pH 8.8 have been found for subsoil and pH 8.5 for surface soil. These figures suggest some substance in the soil more alkaline than calcium carbonate, and from a few tests made it is considered likely that the substance to which the abnormal alkalinity associated with virulent attacks of Phoma is due is magnesium carbonate.

The results of the study as a whole have suggested that infection by Phoma may be successfully combated by the use of treatments reducing the soil alkalinity. Experimentation is in progress to determine whether such remedies are practical.

**Sugar beet root necrosis** [trans. title], A. Terényi (*Pflanzenbau, 5 (1929), No. 21–22, pp. 309–315*).—On the basis of studies of beet root rot during two years in the field and laboratory, the results of which are given in tabular form with discussion, it is stated that the organism spreads via soil as well as seed. Absolute protection at present therefore appears hardly practicable, though when the soil infection is not very severe a fair profit can be realized. Lime in the soil gave no positive result. Further experimentation suggests alteration in the amount of artificial fertilizers.

**Peculiarities of the decay process in the roots of beets during the fall of 1927** [trans. title], G. S. Nevodovskiĭ (*Nauch. Zap. Sakh. Promysh., 6 (1928), No. 9–10, pp. 305–315, figs. 15*).—The author describes the types of fungi associated with decay of sugar beets in storage pits. Activity in the fungi during the fall of 1927 was intensified by premature digging. The isolations gave *Cladosporium herbarum*, which apparently did little damage, besides Actinomycetes and Penicilliums whose activities were not established. Of the destructive fungi, the Fusariums were most prominent, though *Botrytis cinerea*, Trichothecium, and Verticillium were important. The Mucors were always noted in association with the Penicilliums. Rhizopus forms were abundant. *R. betavora* is provisionally described as a new species, parasitic on sugar beets.

**The influence of gaseous reagents on fungi prevalent in the sugar beet storage pits** [trans. title], G. S. Nevodovskiĭ (*Nauch. Zap. Sakh. Promysh.*, 7 (*1929*), *No. 8, pp. 281–286*).—The author tested on a laboratory scale the effects of sulfur dioxide, formaldehyde, and paradichlorobenzene on the fungi which attack sugar beets in storage pits. Sulfur dioxide proved to be the most effective, the only genera which resisted its action being Botrytis and Phoma. The next in effectiveness was formalin. Paradichlorobenzene proved to be of little value.

**Sugarcane diseases** [trans. title], M. T. Cook, trans. by F. Chardón (*Porto Rico Dept. Agr. and Com. Sta. Circ. 94* (*1931*), *Spanish ed., pp. 45, figs. 17*).—Various important diseases of the sugarcane are described and discussed, and suggestions presented upon their control.

**The dry rot of swedes and turnips caused by Phoma lingam (Tode) Desm.**, P. A. Murphy and W. Hughes ([*Irish Free State*] *Dept. Agr. Jour.*, *29* (*1929*), *No. 1, pp. 29–40, fig. 1*).—The maximum percentage of occurrence of *P. lingam* found to date on seeds of swede turnips (*Brassica rutabaga*) of English origin is said to have been 0.2. Species of Macrosporium, Alternaria, and other fungi not connected with dry-rot usually occurred more abundantly on the seeds. *P. lingam* as isolated from the diseased seed and leaf is said to be identical with the dry-rot organism and capable of producing dry-rot in the roots. It is identical with the fungus causing a similar trouble in New Zealand. It can overwinter in diseased roots in the ground and infect the new crop.

The distribution of the disease in the Irish Free State is outlined, and the supposedly contributory factors are discussed. Inferentially, the amount of disease developing depends upon the amount of infection carried with the seed, or else, according to other observations, upon infection from other sources, such as manure or soil.

The difficulty of reconciling the great excess of disease which developed in one variety in 1928 with the small amount of seed infection found is discussed. There are said to be difficulties at least as great in showing it due to greater susceptibility, though this admittedly may have been a contributory factor. It is thought that the seed infection was mainly responsible, but that to the varying amounts of this factor may be attributed the variation in the amounts of seed infection.

**Excess soluble salts as the cause of vegetable diseases in greenhouses**, S. D. Conner and C. T. Gregory (*Ind. Acad. Sci. Proc.*, *43* (*1927*), *pp. 385–390, figs. 3*).—In many Indiana greenhouses lettuce in ground beds remains stunted or else dies, the leaves being small, usually dark green, and very tough, the roots being sparse, brown, and dead at the tips. No nematodes, fungi, or bacteria appear in causal connection with the conditions, which usually appear in spots, irregular as to size, and lying in the midst of perfectly normal plants, or perhaps containing groups of normal plants. Supposedly, high osmotic tension due to concentration makes it difficult for the plant to get sufficient water. This view is supported by the fact that old greenhouse soils left to leach in the rain are often greatly improved. Steaming or heavy watering may help, presumably by dissipating the excess salts. Tile drains permit leaching in such cases without water-logging the soil.

**Copper sulphate as a remedy for exanthema in prunes, apples, pears, and olives,** R. E. SMITH and H. E. THOMAS (*Phytopathology, 18 (1928), No. 5, pp. 449–454, figs. 4*).—Exanthema, described previously in connection with citrus trees only, in particular orange and grapefruit, is claimed to exist in typical form in French prunes (*Prunus domestica*), apples, pears, and olives.

Some attendant conditions are described, and an account is given of the beneficial use of copper sulfate applied to the soil.

**Classification of copper fungicides,** E. B. HOLLAND and G. M. GILLIGAN (*Phytopathology, 18 (1928), No. 5, pp. 455–458*).—Various compounds and forms, both soluble and insoluble, for application as a spray or as a dust are given in systematic arrangement.

**Studies of the ascigerous stage of Venturia inaequalis (Cke.) Wint. in relation to certain factors of the environment,** E. E. WILSON (*Phytopathology, 18 (1928), No. 5, pp. 375–418, pls. 2, figs. 6*).—In the present work, dealing primarily with the ascigerous stage of *V. inaequalis* in relation to some of the more important factors affecting its development, special consideration has been given to the influence of these factors on the production of a timely and abundant ascosporic inoculum for the initiation of apple scab epidemics.

The results of the studies reported indicate that the quantity of perithecia produced in overwintered leaves bears a direct relationship to the type and abundance of lesions on the leaves. Studies of the development of perithecia and descriptions of the grosser stages by which this development may be traced are reported. Meteorological factors, cultural practices and soil, the scab disease, and varietal differences of the apple appear to be important in causing variability in the time of leaf fall. Hyphae penetrated from the subcuticular stromatoid layer into the leaf interiors at temperatures ranging from 4 to 28° C. The optimum temperature for the starting and early growth of perithecia in oatmeal agar, agar made from dead apple leaves, and naturally infected dead leaves was near 13°. Growth on malt extract agar showed differences which are discussed. The optimum temperature for maturation of ascospores appears to be near 20°. Perithecia were initiated as readily in leaves which were moist enough to be fully pliable as in leaves which were wet. Perithecia matured more rapidly in leaves which were alternately wet and dry than in leaves which were continuously wet. Continuous moisture led to certain abnormalities in perithecial development. Young terminal leaves produced perithecia as readily and abundantly as did the older spur or terminal leaves.

**Strawberry dwarf,** A. G. PLAKIDAS (*Phytopathology, 18 (1928), No. 5, pp. 439–444, figs. 2*).—This preliminary report of a general study of strawberry diseases carried on under the direction of C. W. Edgerton gives a pathological description of a rather serious disease of the strawberry plant prevalent in the strawberry-growing district of Louisiana, together with some observational and experimental evidence concerning the nature of the disease and an account of its history, distribution, importance, and etiology.

The most conspicuous symptom of the disease is the severe stunting or dwarfing of the entire plant, suggesting the name dwarf, which is proposed. The disease is thought to be one of the main causes of the marked reduction in strawberry yields in Louisiana during recent years.

No variety susceptibility tests have been carried out, but so far the disease has been found only on the variety Klondike.

**"Black tip," a finger-tip disease of the Chinese banana in Bermuda,** L. OGILVIE (*Phytopathology, 18 (1928), No. 6, pp. 531–538, figs. 3*).—A finger tip disease of the Chinese banana (*Musa cavendishii*) known as black tip is described as prevalent during the summer months in Bermuda. The disease is due to *Cercospora musarum*, which also causes characteristic leaf spots.

**Histology of the lesions produced by Sphaceloma fawcettii Jenkins on leaves of Citrus,** H. S. CUNNINGHAM (*Phytopathology, 18 (1928), No. 6, pp. 539–545, figs. 2*).—This paper presents a part of the author's doctorate investigations on the pathological histology of citrus leaf lesions.

**Dry rot of gladiolus corms,** L. M. MASSEY (*Phytopathology, 18 (1928), No. 6, pp. 519–529, pls. 2, figs. 3*).—A description is given of gladiolus dry-rot, an important disease of gladiolus corms in the United States and Canada and one occurring in England, France, and Holland. The causal organism is said to have been placed in the genus Sclerotium because of the structure of the sclerotium and the absence of spores other than microconidia. The characters are recorded, and a new species, *S. gladioli*, is made.

Infection of uninjured corms in the laboratory and of those growing in the greenhouse and experimental gardens was readily obtained. No satisfactory disinfection treatment of diseased corms has been found. A 4- or 5-year crop rotation is believed necessary to control dry-rot, this practice being combined with the sorting out of diseased corms and the proper handling of corms at harvest and during storage.

**Oleander bacteriosis in California,** C. O. SMITH (*Phytopathology, 18 (1928), No. 6, pp. 503–518, pls. 3*).—A disease of *Nerium oleander*, found sporadically in California nurseries for some years, has occasionally been troublesome to control. The history, symptoms, and infection channels are outlined, with an account of artificial inoculations and of pathological histology. The relationships of the causal organism are discussed, and the organism is suggestively described as a new variety or strain of *Pseudomonas savastanoi* under the name *P. savastanoi nerii*.

**A fungus disease of conifers related to the snow cover,** J. H. FAULL (*Jour. Arnold Arboretum, 10 (1929), No. 1, pp. 3–8*).—Phacidium blight of conifers, a disease favored by a winter-long snow covering, is said to be caused in Europe by *P. infestans*, attacking *Pinus sylvestris*, and in America by a form or forms very similar to or identical with *P. infestans*, attacking various conifers, the firs and some spruces being especially susceptible. The spread by contagion is extensive under the snow cover in late winter and early spring, but there is none during the summer. Any nursery or plantation in a snow-covered area, especially in a forested district, is liable to develop this disease, which may spread rapidly and cause heavy losses.

As the organism is native, a certain tendency toward balance between host and parasite can be noted under natural conditions. A reforestation policy in snow-laden areas is liable to failure if the Phacidium blight remains uncontrolled. Control is claimed to be easy and comparatively inexpensive.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**A guide to the winter birds of the North Carolina sandhills,** M. P. SKINNER and J. W. ACHORN (*Lancaster, Pa.: Science Press Ptg. Co., 1928, pp. XIV+301, pls. 15, figs. 30*).—The main part of this work, by Skinner, deals with The Winter Birds of the Sandhills of North Carolina (pp. 1–282). Then follow several accounts by Achorn, namely, Needed—Pocket Bird Guide of Land Birds in Winter in the South (pp. 286, 287), Birds of the Sandhills (pp. 288–290), and Bird Golf (pp. 291–295).

**New Zealand birds,** W. R. B. OLIVER (*Wellington: Fine Arts (N. Z.) Ltd., 1930, pp. VIII+541, pls. 6, figs. 199*).—The author first considers the history of ornithological discovery in New Zealand, structure of birds, ecology, geographical distribution, migration, changes in the fauna, economic value of birds, and classification. The birds of New Zealand are then considered at length (pp. 28-525), the arrangement being by orders.

**On the ecology and control of slugs,** H. W. MILES, J. WOOD, and I. THOMAS (*Ann. Appl. Biol., 18* (*1931*), *No. 3, pp. 370–400*).—In part 1 of this account (pp. 371–389) the authors deal with ecology. In part 2 (pp. 389–399) experimental work on the control of slugs, including *Agriolimax agrestis* L., *Milax sowerbii* Fér., and *Arion subfuscus* Drap., is reported upon.

**The European brown snail in California,** A. J. BASINGER (*California Sta. Bul. 515* (*1931*), *pp. 22, figs. 16*).—This is a summary of information on *Helix aspersa* Müller, first recorded from California at Santa Barbara in 1850 and now found in most of the cultivated districts of the State from San Diego County to Sonoma County. Following a brief account of its history and distribution, a description is given and its classification noted. Its life history and development, considered at some length, includes tabular data on the number of eggs laid at each oviposition for various localities and dates, and at Fullerton in 1929 matings and oviposition records, incubation period of eggs laid between June 11 and October 19, a comparison of the number of whorls in snails of different ages, and observations on the nocturnal and diurnal activity of *H. aspersa.* Discussions of its behavior, economic importance, and control follow.

It is pointed out that the presence of snails in large numbers about a residence is objectionable aside from the damage done to gardens, since they crawl about on lawns and walks during the night and are liable to be stepped upon. The damage to plants may or may not be of economic importance, thus it may be negligible if they are feeding mostly on weeds or on lawn grass where their feeding only shortens the blades. They may be very injurious, however, especially to young tender plants in vegetable and flower gardens. Frequently enormous populations become established in citrus groves and do considerable damage to leaves and fruit. Infested trees may be detected even before the snails are seen because of the riddled appearance of the foliage. Much damage may be done to the fruit, especially during the rainy weather, when even the slightest injury to the skin gives entrance to decay organisms. The author has failed to substantiate reports of their injury to the bark of the green twigs.

Control consists principally in the use of contact poisons or irritants, hand picking, or poison baits, the last being by far the most effective. A bait composed of 1 part of calcium arsenate and 16 parts of wheat bran is said to have proved very satisfactory when the two materials are mixed dry and enough water added to make a moist but not wet mash. For field treatment in citrus groves, it was found that 4 lbs. of bran and 4 oz. of calcium arsenate were sufficient to treat the area underneath five trees abundantly.

**Constant temperature and humidity apparatus for use in the experimental study of insects,** T. A. BRINDLEY and C. H. RICHARDSON (*Iowa State Col. Jour. Sci., 5* (*1931*), *No. 4, pp. 211–222, figs. 3*).—This is a detailed account of the construction, with illustrations, of an apparatus devised for temperature and humidity control.

**Further studies on the insect fauna of Iowa prairies,** G. O. HENDRICKSON (*Iowa State Col. Jour. Sci., 5* (*1931*), *No. 4, pp. 195–209*).—The author reports upon 144 species additional to those previously noted (E. S. R., 63, p. 151).

**[Report of work in entomology at the Missouri Station],** L. HASEMAN ET AL. (*Missouri Sta. Bul. 300* (*1931*), *pp. 68–71*).—The new apple worm attracting attention at Waverly, which has been identified as *Carposina fernaldana,* was carried through its yearly cycle by Haseman and G. D. Jones. This insect, which has been found from New York to Missouri but never before on apples, breeds and feeds habitually in the common red haw in Missouri. The moths emerge outdoors about July 1. The larvae continue to work in apples and haws until the middle or last of November, wintering as the caterpillar in a spherical cocoon covered with sod or soil about 0.5 in. below the surface of the ground. Before pupating, the caterpillar reopens its cocoon and changes it from a spherical to an oblong cocoon on the surface of the soil. It then pupates and later emerges as a small moth of a grayish color with lighter markings. While it has caused some anxiety in the Waverly area, it is doubtful if it will become a serious pest where modern orchard management is practiced.

In studies by Haseman and Jones of the life cycle of the codling moth at Waverly, Columbia, and St. Joseph distinct peaks of three broods of moths were observed for each place. The first broods emerged late, but the hot, dry summer made possible an unprecedented abundance of later moths. The first or spring brood of moths appeared in two well-developed peaks, the first coming the first week in June, the second during the last week in June. The second brood also appeared in two peaks, the first about July 15 and the second about July 25. The third brood appeared as a heavy brood, beginning in great numbers about August 15 and continuing to emerge in great numbers until September 1.

Bait traps kept in the orchard filled with a ferment caught large numbers of moths each night when they were emerging. It is thought that they should prove a valuable aid in worm control if the moths are actually caught before they oviposit. The peak of bait trap catch occurred about one week following the peak of moth emergence, as shown by baiting records.

Three types of tree bands, namely, burlap, tar paper, and corrugated paper, were used by Haseman, Jones, and P. H. Johnson in banding work with the codling moth. Corrugated bands treated with a mixture of $\beta$-naphthol and engine oil were also used for investigating their value for killing the apple worms after leaving the fruit and forming their cocoons. With the dry, hot summer an unusually high kill was secured with treated bands. In all the orchards where they were tested the average kill ran around 86 per cent of the cocooned worms. Pine tar sprays for application on apple tree trunks early in the spring proved noneffective in killing worms at Columbia.

In continuing the study of the Hessian fly-resistant qualities of different varieties of wheat, Haseman and Johnson noted an apparent loss of the earlier evidence of immunity by the Illinois Chief strain, both in the greenhouse and in the field tests.

In the comparison made by Haseman and Johnson of dusting (1) with copper-lime-arsenate of lead and (2) sulfur-arsenate of lead and spraying apples for control of apple insects, the regular liquid spray gave the better control of apple worms, and dusts better control of the plum curculio.

In control work with the striped cucumber beetle every available commercial brand of fluosilicate and synthetic fluosilicate or cryolite was used by Haseman and Johnson, no burning resulting to squash, cucumber, pumpkin, or cantaloupe under dry conditions of early summer. In a comparison of arsenicals with fluosilicates made on two plats at the rate of 1 lb. of calcium arsenate to 15 lbs. of gypsum and 1 lb. of lead arsenate to 10 lbs. of hydrated lime very few beetles appeared before July 1 and no serious injury resulted.

In counts made by Haseman of the winter mortality of insect pests, it was found that from 90 to 100 per cent of the codling moth larvae above the snow line had been killed in some orchards. The observations which followed showed that in spite of the high winter mortality the pest was able to build up to scourge proportions where spraying work was not properly done. The high winter mortality of the San Jose scale apparently gave this pest a permanent setback.

**[Contributions on economic entomology]** (*Ky. State Hort. Soc. Trans., 1930, pp. 31–39, 40–51, figs. 2, pp. 52–60, 146–153*).—The contributions relating to economic entomology here presented are as follows: Present Status of the Oriental Fruit Moth, by W. A. Price (pp. 31–39); Recent Developments in Orchard Insect Control, by W. P. Flint (pp. 40–49); Curculio Control of Peaches in Georgia and South Carolina, by E. H. Rawls (pp. 52–57); The Spray Schedule for 1931, by W. W. Magill (pp. 58–60); and The Seriousness of Our Present Codling Moth Situation, by F. Street (pp. 140–153).

**Sixty-first annual report of the Entomological Society of Ontario, 1930** (*Ent. Soc. Ontario Ann. Rpt., 61 (1930), pp. 99, fig. 1*).—In the first part of this report the insects of the season 1930 (E. S. R., 64, p. 357) are reported for the several Provinces, those in Ontario, by Caesar, Ross, Stirrett, Dustan, Hammond, Hall, Hudson, Baird, and Schedl. (pp. 7–10): Nova Scotia, by F. C. Gilliatt (pp. 10–13); New Brunswick, by R. P. Gorham, L. J. Simpson, and G. P. Walker (pp. 13–17); Quebec, by C. E. Petch and G. Maheux (pp. 18, 19); Manitoba, by A. V. Mitchener and N. Criddle (pp. 20–22); Saskatchewan, by K. M. King, E. McMillan, and K. E. Stewart (pp. 23–27); central Alberta, by E. H. Strickland (pp. 27, 28); southern Alberta, by H. L. Seamans (pp. 28, 29); and British Columbia, by E. R. Buckell (pp. 30–32).

The following contributions are then presented: The Insect Situation in Michigan, by R. H. Pettit and R. Hutson (pp. 33–35); Entomology and the Arts Curriculum, by J. D. Detwiler (pp. 35–38); Notes on the Palmer Worm (*Dichomeris ligulella* Hub.) and the Red Banded Leaf Roller (*Eulia velutinana* Walker), by J. A. Hall (pp. 38–41); Pyrethrum, the Location in the Plant of the Potent Principle, by F. A. Herman (pp. 41–43); Corn Borer Situation in Ontario in 1930, by L. Caesar (pp. 43–48); Preliminary Observations on the Winter Mortality of the Larvae of the European Corn Borer in Ontario and Quebec, by G. M. Stirrett (pp. 48–52): Further Notes on the Mortality and Feeding Habits of Newly-Hatched Oriental Peach Moth Larvae, by G. G. Dustan (pp. 52–57); The Biological Control Factors Affecting the Abundance of the Oriental Peach Moth (*Laspeyresia molesta* Busck) in Ontario during 1930, by W. E. Steenburgh (pp. 57–65); A Brief Survey of the Organization and Projects of the Belleville Parasite Laboratory, by A. B. Baird (pp. 65–68); The Blueberry Maggot Situation in Canada—a Preliminary Report, by L. S. McLaine (pp. 68, 69); The White Grub [*Phyllophaga anxia* Lec.] Situation in Eastern Canada, by G. H. Hammond (pp. 69–73); The Satin Moth in the Maritime Provinces, by W. N. Keenan (pp. 73, 74); Notes on Jack Pine Sawflies in Northern Ontario, by K. Schedl (pp. 75–79); Notes on the Occurrence of the Pine Bud Moth (*Exoteleia dodecella* L.) in Welland County, Ontario, by R. W. Sheppard (pp. 79–81); Notes on the Recovery of Onion Maggot Material from Soil Samples by the Use of a Centrifuge, by A. G. Dustan (pp. 81, 82); Notes on Chemotropic Responses of Certain Insects, by J. Marshall (pp. 82–84); Experiments on the Control of the Gray-Banded Leaf Roller (*Eulia mariana* Fern.), by A. Kelsall and N. A. Patterson (pp. 84, 85); and The Entomological Record, 1930, W. J. Brown (pp. 86–95).

**Report of the entomological division for the year 1930**, L. D. Cleare, jr. (*Brit. Guiana Dept. Agr. Rpt. 1930, pp. 85–90*).—An account of the occurrence of and work with the more important insects of the year in British Guiana.

**[Contributions on economic insects and their control]** (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1929, pp. 93–98; 99, 100, pl. 1; 101–114, pls. 10, fig. 1; 115–129*).—The contributions here presented are as follows: Further Observations on a Pyrethrum Spray Fluid (pp. 93–95) (E. S. R., 62, p. 448) and Examination of Plants for Insecticidal Principles, I (pp. 96–98), both by F. Tutin; The Common Green Capsid Bug (*Lygus pabulinus*) as a Pest of Sugar Beet, by C. L. Walton and L. N. Staniland (pp. 99, 100); Tar Distillate Washes as a Control for Apple Capsid Bug [*Plesiocoris rugicollis*]—

Field Experiments, 1929, by L. N. Staniland and C. L. Walton (pp. 101–114) (E. S. R., 63, p. 250); The Raspberry and Loganberry Beetle [*Byturus tomentosus*] and Its Control—Some Experiments with a Pyrethrum Emulsion Spray, by C. L. Walton (pp. 115–123); and Experiments on the Control of Pear Midge (*Contarinia pyrivora*), by L. N. Staniland and C. L. Walton (pp. 124–129).

**[Contributions on economic entomology]** (*Welsh Jour. Agr., 7 (1931), pp. 332–349, pls. 5; 358–367*).—The contributions here presented are as follows: Trials on the Control of Certain Horticultural Pests in North Wales, by W. M. Davies (pp. 332–349); Notes on Unusual Pest Occurrences in 1930, by H. W. Thompson (pp. 358–363); and The Possible Association of the Sheep Nostril Fly (*Oestrus ovis*) with Pneumonia in Sheep, by N. Bisset (pp. 363–367).

**The relative value of tar-distillate washes, spring washes, and grease-banding in any scheme of insect control,** A. M. MASSEE (*East Malling [Kent] Research Sta. Ann. Rpt., 18 (1930), pt. 1, pp. 111–120*).—The author here presents information on the insect pests which can be controlled by tar-distillate washes and discusses the most economical strength of spray to use and the critical time for applying the wash to the various kinds of fruit. A review is also given of the insects not affected by these washes and of those only partially controlled. He emphasizes the fact that spring washes, namely, nicotine and soft soap, lead arsenate, and lime-sulfur, must be used in addition to tar distillates when certain insect pests are present in a particular orchard.

**Extracts of pyrethrum: Permanence of toxicity and stability of emulsions,** F. TATTERSFIELD and R. P. HOBSON (*Ann. Appl. Biol., 18 (1931), No. 2, pp. 203–243, figs. 5*).—In studies at the Rothamsted Experimental Station it was found that "pyrethrum flowers (*Chrysanthemum cinerariaefolium*), both as whole heads and as powder retain their insecticidal properties at ordinary temperatures and at 28° C. [82.4° F.] for considerable periods if stored in closed vessels. If exposed to the atmosphere in a thin layer as finely ground powder there is risk of loss of toxicity. Alcohol and petroleum extracts of pyrethrum retain their toxicity in temperate climates over many months. Alcohol extracts readily give permanent emulsions when added to water. Petroleum extracts require the incorporation of an emulsifier. Water-miscible petroleum extracts of pyrethrum can be prepared by the addition of certain materials, such as ammoniated Agral W. B. and neutral turkey red oil.

"A study has been made of the degree of permanence of the active principles in alcoholic and water-miscible petroleum extracts at ordinary British temperatures and at 28° and also in emulsions of these extracts in alkaline spray fluids of varying pH. The active principles proved more permanent than has been usually supposed. The readiness with which water-miscible petroleum extracts disperse in the aqueous phase and the stability of the emulsions formed under a variety of conditions have been investigated."

**Tobacco pests,** J. H. SMITH (*Queensland Agr. Jour., 36 (1931), No. 2, pp. 195–212, pl. 1, figs. 28*).—A practical account of the more important insect enemies of tobacco in Queensland.

**The forest insects of central Europe: A textbook and handbook, III, Special Part, II,** K. ESCHERICH (*Die Forstinsekten Mitteleuropas. Ein Lehr- und Handbuch. Berlin: Paul Parey, 1931, vol. 3, Spec. pt., sect. 2, pp. [XI]+825, pls. 14, figs. [619]*).—In this third volume of the work previously noted (E. S. R., 51, p. 253) the orders Panorpatae and Trichoptera are first considered (pp. 1–5). The remainder of the work deals with the Lepidoptera, exclusive of the Bombycidae, Sphingidae, and Rhopalocera, which are to be dealt with in a fourth and final volume. The general part of the account of the Lepidoptera (pp. 6–126) deals with their classification, morphology, and biology, economic importance and epidemiology, diseases, and control by use of insecticides, together with a list of the general literature on the classification and biology of the Lepidoptera. Lists of references to the literature follow each of the family accounts.

**Observations on the hibernation and spring oviposition of Lygus pratensis Linn.**, M. D. AUSTIN (*Ent. Mo. Mag.*, *3. ser.*, *17* (*1931*), *No. 199*, *pp. 149–152*, *figs. 3*).—The information presented, together with records of both spring and autumn oviposition, indicates that two generations of the tarnished plant bug occur each year in England, as has been reported from the United States.

**Contributions to the biology of Cimex lectularius L., I, II** [trans. title], H. KEMPER (*Ztschr. Wiss. Biol.*, *Abt. A*, *Ztschr. Morph. u. Ökol. Tiere*, *19* (*1930*), *No. 1*, *pp. 160–183*, *figs. 4*; *22* (*1931*), *No. 1*, *pp. 53–109*, *figs. 9*).—The first part of this contribution deals with the influence of infrequent feeding or starvation on the bedbug and the second with its molting. Lists of 30 and 33 references, respectively, to the literature are included.

**The control of the bronze orange bug**, W. A. T. SUMMERVILLE (*Queensland Agr. Jour.*, *36* (*1931*), *No. 2*, *pp. 138–140*).—A brief account of control measures for *Rhoecocoris sulciventris* Stal. on the orange.

**The leaf hoppers attacking apple in the Ozarks**, A. J. ACKERMAN and D. ISELY (*U. S. Dept. Agr.*, *Tech. Bul. 263* (*1931*), *pp. 40*, *figs. 14*).—This is a report of a cooperative study conducted by the U. S. D. A. Bureau of Entomology and the Arkansas Experiment Station at Bentonville, Ark., at intervals from 1918 to 1929. It is pointed out that while the injury to the apple caused by leafhoppers is not so evident as that caused by other insects which attack the fruit itself, the crop is reduced and the trees are weakened on account of the injury to the foliage caused by the feeding of the leafhoppers. Their importance, biology, distribution, and rearing methods are considered, and a technical description is given of the several stages. A comparison is made of the life histories and habits of the five species. The natural enemies are then taken up, followed by control measures. A list of 45 references to the literature is included.

The five species reported upon are the oblique-striped apple leafhopper (*Erythroneura obliqua*), the red-spotted apple leafhopper (*E. maculata*), the white apple leafhopper (*Typhlocyba pomaria*), the potato leafhopper (*Empoasca fabae*), and the green apple leafhopper (*E. maligna*). The two species of Erythroneura have been found to be the most injurious in the Ozark district as they are less affected by dry, hot weather. None, however, is of primary importance.

It was found that the leafhoppers may be controlled by a contact spray applied before the nymphs transform to the adult stage. Experiments with nicotine sulfate at dosages as weak as 1–1,600 showed good commercial control. The addition of 1 lb. of rosin fish-oil soap to each 50 gal. of spray solution made the treatment slightly more effective. A 2 per cent lubricating oil emulsion and fresh nicotine-hydrated lime dusts (containing up to 2 per cent of actual nicotine) were found to be less satisfactory than the sprays of nicotine sulfate. Bordeaux mixture, either a 3-4-50 or a 3-10-50 dilution, when used alone was ineffective against the two species of Erythroneura.

**Preliminary experiments on the physiology of the resistance of certain rootstocks to attack by woolly aphis**, W. A. ROACH and A. M. MASSEE (*East Malling* [*Kent*] *Research Sta. Ann. Rpt.*, *16–18* (*1928–1930*), *pt. 2*, *pp. 111–120*, *pl. 1*, *figs. 2*).—The reciprocal transfer of filtered extract of the bark of a susceptible apple, Allington Pippin, to an immune variety, Northern Spy, resulted in no change in the reaction of the host to woolly aphid. The length of life of adult insects was apparently not influenced by feeding with extracts of either immune or susceptible apple trees, but some evidence was found that the rate of reproduction was depressed more by the immune apple extract. A yeast and a filamentous fungus were found associated with the woolly aphid.

**Studies on potato virus diseases, VIII, IX,** K. M. SMITH (*Ann. Appl. Biol., 18 (1931), Nos. 1, pp. 1-15, pls. 5; 2, pp. 141-157, pl. 1, figs. 5*).—In part 8, entitled On a Ringspot Virus Affecting Solanaceous Plants, the author reports a marked difference in receptivity of the various solanaceous plants to ring spot virus when transmitted by the green peach aphid. The virus was transmitted by means of this aphid to *Datura stramonium* and *Capsicum* spp. and not to other species.

In part 9, Some Further Experiments on the Insect Transmission of Potato Leaf-roll, experiments bearing on a possible relationship between the leaf roll virus and the green peach aphid are described.

It was found that "the noninfective aphid can pick up the virus of leaf roll from an infected potato plant after 6 hours' feeding. The infective aphid is capable of transmitting the leaf roll virus to a healthy potato plant after 2 hours' feeding. The whole process whereby a noninfective aphid picks up the leaf roll virus and infects a healthy plant can not be performed in 8 hours; a minimum period of approximately 34 hours appears to be necessary. The incubation period of the leaf roll virus in the potato plant, i. e., from the time of infection to the time of the appearance of first symptoms, averages 14 days under the writer's conditions. It has not been found possible to infect healthy potato plants with leaf roll by needle inoculation with the body juices of infective aphids. Infection of progressive series of healthy potato plants with virus-bearing *M[yzus] persicae* showed that the aphids were capable of infecting, respectively, 6, 7, and 10 healthy potato plants without again having access to a source of leaf roll infection. It is noteworthy that occasionally plants in the progressive series of infections failed to develop leaf roll, although plants before and after in the series became infected. The leaf roll virus occurring in American potato varieties, as exemplified by Green Mountain, is as easily disseminated by the aphid *M. persicae* as the leaf roll virus occurring in the British Isles.

"Further inoculation tests with five additional species of aphids are described. Of these five aphids, two were proved to be capable of transmitting the virus of potato leaf roll. These are the potato aphid, *M. pseudosolani* Theob., and the greenhouse aphid, *M. circumflexus* Buckt. Negative results were obtained with two other potato aphids, i. e., *Macrosiphum gei* Koch and *A[phis] rhamni* Boyer, and one greenhouse aphid, *A. gossypii* Glover."

**On the transmission of potato leaf-roll by aphides,** T. WHITEHEAD (*Ann. Appl. Biol., 18 (1931), No. 3, pp. 299-304, pl. 1*).—The author presents evidence to show that *Myzus circumflexus* (Buckt.) is as efficient a vector of potato leaf roll as is the green peach aphid. The implications, both practical and academic, of this fact are discussed, particularly in view of the retardation in the development of symptoms shown by plants infested with *M. circumflexus* carrying the leaf roll virus. *Macrosiphum gei* (Koch) only transmitted the disease once, and its importance as a field vector is still an open question.

**Notes concerning the first papers dealing with the aphid fauna of America,** F. C. HOTTES (*Biol. Soc. Wash. Proc., 44 (1931), pp. 61-69*).—Attention is called to the species of plant lice described by C. S. Rafinesque in 1817 and 1818 and to the little-known paper published by S. S. Haldeman in 1844.

**A contribution towards our knowledge of the Aleyrodidae (white flies) of India,** K. SINGH (*India Dept. Agr. Mem., Ent. Ser., 12 (1931), No. 1, pp.*

*II+98, pls. 37*).—This is a synopsis of the white flies of India, in which a genus is erected and 25 species are described as new.

**The Coccidae of the prickly-pear in South India and their economic importance,** T. V. Ramakrishna Ayyar (*Agr. and Livestock in India, 1* (*1931*), *No. 3, pp. 229–237, pls. 3*).—This is an account of the author's studies of Coccidae of the pricklypear and their economic importance, with a brief review of previous attempts to control pricklypear by insect agency.

**Control of the satin moth by spraying in alternate years,** C. W. Collins and C. E. Hood (*U. S. Dept. Agr. Circ. 189* (*1931*), *pp. 12, figs. 4*).—This contribution reports upon spraying experiments conducted in 1928 and 1929 which have clearly shown that the satin moth, a general account of which by Burgess and Crossman has been noted (E. S. R., 57, p. 164), can be satisfactorily controlled for 2 years by one application of a mixture of lead arsenate powder and water in the proportion of 5 lbs. of the arsenate to 100 gal. of water, with fish oil added as an adhesive. If some of the trees are very tall, and only one-half to two-thirds of the foliage can be treated by the spray equipment available, fairly good control can be obtained by this procedure, but under such conditions it will be necessary to spray every year, as the hibernating larvae on the trees will probably be sufficiently numerous to cause more than negligible injury to the foliage in the following season. By the use of the fish oil the length of time that the spray remains on the foliage is considerably extended, the larger larvae of one generation and the young larvae of the second generation being satisfactorily controlled, provided the spraying is thoroughly done.

**Additional notes on the natural enemies of the iris borer, Macronoctua onusta Grote (Lepidoptera),** E. P. Breakey (*Ann. Ent. Soc. Amer., 24* (*1931*), *No. 1, pp. 40–44*).—The data here presented supplement the information given in the account previously noted (E. S. R., 62, p. 850).

**A method for feeding blood meals to mosquitoes—male and female.—Preliminary note,** P. F. Russell (*Amer. Jour. Trop. Med., 11* (*1931*), *No. 5, pp. 355–358, figs. 2*).—The author describes a method for feeding blood meals to male and female mosquitoes which has proved to be useful and simple.

**The present state of our knowledge regarding the transmission of malaria by the different species of anopheline mosquitoes,** G. Covell (*Rec. Malaria Survey India, 2* (*1931*), *No. 1, pp. 1–48*).—This review of the present status of knowledge of transmission of malaria by species of anopheline mosquitoes is presented in connection with a bibliography of 139 titles.

**Further observations on Paris green as an Anopheles larvicide,** B. S. Chalam (*Rec. Malaria Survey India, 1* (*1930*), *No. 4, pp. 515–522, pl. 1*).—The author finds that "a gentle light breeze up to a limit of 6 miles per hour is best suited for the distribution of Paris green mixture. A wind with a velocity varying from 8 to 12 miles per hour seems to diffuse the dust cloud in all directions and thus prevents it spreading forward. About 180 ft. in the case of the large blower and 110 ft. in the case of the small one seem to be the furthest limit the dust (Paris green and soapstone mixture) can reach under favorable conditions. The destruction of larvae is more complete nearer the blower and then gradually decreases as the distance increases. Up to 50 ft. in the case of the small blower and 80 ft. in that of the large one it is possible to get almost complete destruction of the larvae in open areas with little or no vegetation by using 1 per cent Paris green and soapstone mixture. Regulated according to the correct direction of the wind the dust reaches its furthest limit."

It was found that when applied under identical conditions in paddy fields a 5 per cent mixture was much more effective than a 1 per cent mixture, but 5 times the quantity of 1 per cent mixture was much more effective than the unit quantity of 5 per cent mixture. Even 2.5 times the quantity of 1 per cent mixture appeared to be as strong as a 5 per cent mixture for purposes of larval destruction.

**The fly Eutrixopsis javana Townsend (Diptera, Tachinidae), a parasite of the beetle Leucopholis irrorata in Occidental Negros, Philippine Islands,** A. W. Lopez (*Philippine Jour. Sci., 46 (1931), No. 1, p. 129*).—The author records the rearing of the tachinid fly *E. javana* from *L. irrorata* Chevr. in Occidental Negros.

**Experiments with the heat treatment of fly-infested fruit,** J. A. Weddell (*Queensland Agr. Jour., 36 (1931), No. 2, pp. 141–147*).—In experiments carried out in Queensland with a view to testing the method evolved for handling the Mediterranean fruit fly infested fruit in Florida, it was found possible to approximate the requirements of temperature and relative humidity fairly closely.

"It was proved that exposure to temperatures between 110 and 115° F. at approximately 100 per cent relative humidity for 8 hours would kill the larvae of the Queensland fruit fly (*Chaetodacus tryoni* Frogg.) infesting apples, oranges, peaches, pears, and persimmons. Incidentally it was also found that codling moth larvae were killed by those conditions. Ability to kill the eggs of the Queensland fruit fly in oranges and grapefruit was not proved, owing to the failure of eggs laid in the control fruit to hatch. There is, however, no reason to doubt that the eggs would be killed. A number of the apples became peculiarly soft, watery, and loose skinned, presenting a 'cooked' appearance some 5 days or more after treatment, and this symptom appeared distinct from various storage rots and bruises. Apparently these fruits were affected by the treatment. Only fruit fly infested fruits of peach, pear, and persimmon were used, so the keeping qualities of treated fruits could not be ascertained. It is likely that such fruits would, however, be more adversely susceptible than apples to the treatment. The flavor of the citrus fruit was unaffected."

**On the structure of the immature stages of the frit fly (Oscinella frit Linn.),** A. Steel (*Ann. Appl. Biol., 18 (1931), No. 3, pp. 352–369, figs. 11*).—Following introductory remarks with a description of the technic, an account is given of the structure of the egg, the three definite larval instars observed, and the puparium.

**A bibliography of the banana root-weevil,** M. D. Leonard (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 2, pp. 147–176*).—This is an extended bibliography of 215 titles, all but 23 of which were examined by the author.

**The effects of dry heat on weevils in corn and on corn seeds,** E. M. Paller (*Philippine Agr., 17 (1929), No. 9, pp. 537–549, figs. 2*).—The author finds that the lethal temperatures for the rice weevil, granary weevil, and *Tribolium confusum* Duv., which attack corn grains, are 50° C. (122° F.) for 45 minutes, 55° for 20 minutes, 60° for 10 minutes, and when heated at 65° for even less than 1 minute. At these lethal temperatures the larvae, pupae, and adults perish. The viability and vitality of the seeds of 10 varieties of field corn and of sweet corn and pop corn were not affected when heated to 45, 55, and 65° for 30 minutes or for 1 hour. The productivity of the Calauan Yellow variety of flint corn was not affected when heated to 45, 55, and 65° for 30 minutes or for 1 hour. Corn seeds can therefore be heated (dry heat) to a temperature sufficient to kill weevils attacking them without affecting their viability, vitality, or production. Dry heat can be safely used as a means to control weevils attacking corn in storage and in mills.

**How to stop "weevil" damage in stored grain**, W. P. FLINT (*Illinois Sta. Circ. 380 (1931), pp. 4, figs. 3*).—This is a brief practical account.

**Key to known pupae of the genus Calendra, with host-plant and distribution notes**, A. F. SATTERTHWAIT (*Ann. Ent. Soc. Amer., 24 (1931), No. 1, pp. 143–172, figs. 43*).—The introductory part of this contribution consists of a discussion of the geographical distribution and of characters of the genus Calendra, formerly Sphenophorus. Descriptions of the pupae of 24 species of the genus are next presented, followed by a key for their separation and Calendra and host-plant lists.

**The distribution of stimulative efficiency in the ultra-violet spectrum for the honeybee**, L. M. BERTHOLF (*Jour. Agr. Research [U. S.], 43 (1931), No. 8, pp. 703–713, figs. 3*).—The results of various researches are said to have shown clearly that honeybees are sensitive to ultra-violet light and to have indicated that the efficiency of this light is fairly high.

In the present investigation, a mercury vapor lamp, of quartz, was used as the source of the radiation studied. Light from this lamp was passed through a spectroscope (Monochromator) provided with lenses and prisms of quartz, and from the resulting spectrum ultra-violet light of eight different wave lengths was tested for its effect on the bees. The relative energy of each illumination with ultra-violet light was separately determined.

"By dividing the values of the several stimulative effects by the corresponding relative values for energy, the relative efficiency—i. e., the relative stimulative effect per unit of energy—of the ultra-violet light of each wave length concerned was derived. The results show that its efficiency is highest at wave length 365 mμ, and that the spectrum extends at least down to wave length 297 mμ but not to 280 mμ. When the curve representing the distribution of stimulative efficiency in the ultra-violet spectrum is joined to that for the so-called visible spectrum, as found by the writer in a previous investigation [E. S. R., 65, p. 362], there are shown to be two maxima, one in the yellow-green at wave length 553 mμ, and the other in the ultra-violet at 365 mμ, the latter being about 4.5 times as great as the former."

**Nectar and pollen plants of California**, G. H. VANSELL (*California Sta. Bul. 517 (1931), pp. 60, figs. 64*).—A brief introduction and a discussion of nectar secretion are followed by an account, arranged alphabetically by genera, of about 175 nectar- and pollen-yielding plants of sufficient importance as nectar yielders to be worthy of mention. A table giving the characteristics and value of various California plants as sources of honey, including the name of plant, family, whether native or introduced, color of blossom, time of blossoming, color of honey, and value as a source of honey, is appended.

**Hive temperatures for each hour of a day**, W. E. DUNHAM (*Ohio Jour. Sci., 31 (1931), No. 3, pp. 181–188, fig. 1*).—Following a brief introduction and a review of important papers on hive temperatures during summer, an account is given of the conditions under which the experiment was conducted, followed by hive temperatures for the day reported in tabular and chart form.

**Control of the harvester ant**, A. A. NICHOL (*Arizona Sta. Bul. 138 (1931), pp. [1]+639–652, figs. 10*).—Following a brief introduction and discussion of items bearing on poision practice, the use of precipitated calcium carbonate (chalk) and sodium arsenite is considered, including methods of application, a variation of the arsenite poison, costs of materials, and physical and chemical properties of the poison. Then follow discussions of other ant poisons and control methods, including calcium cyanide, chloropicrin, paradichlorobenzene plus calcium cyanide, white arsenic, carbon bisulfide, London purple, Paris green, lead chromate, and sodium cyanide. The formula for the precipitated calcium carbonate and sodium arsenite developed, which when properly made and applied has been highly successful, consists of sodium arsenite 20 per cent, cornstarch 5 per cent, Paris green 1 per cent, and calcium carbonate (precipitated) 74 per cent.

After the materials are thoroughly mixed, the poison—4 to 6 oz.—should be scattered in a loose encircling ring about 24 to 30 in. in diameter with the opening of the net at the center. In two sets of applications in the Santa Cruz Valley, where the black harvester ant predominates, using 40 nests the first time and 51 the second, 81 per cent and 77 per cent, respectively, were cleaned out with the first application. In a later, third series where 72 nests were treated, 64 nests, or 89 per cent, evidently were killed. This later poison, however, was put out in September, and since ants frequently "hole up" for several months when threatened by poison, it is necessary to wait a longer time before an accurate statement can be made. In any case, two, or occasionally three, applications will be effective, and the ease and economy with which the poison can be applied does not make this prohibitive. In the Salt River Valley, where the red variety is most numerous, a slightly lower percentage of kill was obtained for all types and kinds of poisons.

**Investigations of the larva of the pine sawfly, Nesodipron japonica Marl.** [trans. title], Z. Kitao (*Jour. Col. Agr., Imp. Univ. Tokyo, 11 (1931), No. 2, pp. 151–191, figs. 78*).—The first part of this account of *N. japonica* deals with its morphology and anatomy (pp. 152–184), followed by an account of the biology and means of control (pp. 184–189).

**Heterospilus cephi Rohwer, a parasite of the European wheat sawfly, Cephus pygmaeus (L.)**, C. C. Hill and H. D. Smith (*Jour. Agr. Research [U. S.], 43 (1931), No. 7, pp. 597–609, figs. 8*).—The authors here report upon a study of the morphology and life history of a major parasite of *C. pygmaeus*, which was first reared from this host by D. T. Ries in 1924, was described by Rohwer in 1925 (E. S. R., 53, p. 656), and reported upon by Ries in 1926 (E. S. R., 54, p. 355). So far as is now known, its geographical distribution covers most of the western wheat-growing area of New York State and a limited area in northern Pennsylvania. The percentage of parasitism increased from 21 per cent in 1924 to 39 per cent in 1927, with a coincident decrease in abundance of the host from 31 to 3 per cent. In 1928 there was a sharp decrease in parasitism to 9 per cent, and in 1929 to 1 per cent.

"There is one generation a year. Oviposition occurs during the last part of June and in early July, while the host larvae are feeding within the wheat stems. The period of incubation and feeding occupies about 3 weeks; about 10 months are then spent in the mature larval stage within the silken cocoon. With the advent of warm days in the spring, pupation takes place, and about a month is spent in the prepupal and pupal stages. The length of life of the adult is from 1 to 2 weeks. The female inserts her ovipositor into the wheat culm and lays from 1 to 6 eggs on the surface of the host larva feeding inside the stem. The parasitic larva remains on the surface of the host larvae and feeds through the epidermis of the host. It passes through three distinct instars and spins a whitish silken cocoon within the hollow of the wheat steam. An average of three parasites were found to mature on a single host. The sex ratio showed 47 per cent of the adults to be females."

**The strawberry Tarsonemus**, A. M. Massee (*East Malling [Kent] Research Sta. Ann. Rpt., 18 (1930), pt. 1, pp. 109, 110*).—A brief account is given of the occurrence of the strawberry tarsonemid mite in England, together with a list of localities from which it has been recorded. The damage caused by the mite is described, and tentative suggestions for its control are outlined.

## ANIMAL PRODUCTION

**[Nutrition studies in Missouri]** (*Missouri Sta. Bul. 300 (1931), pp. 23, 27–29, 62–64, fig. 1*).—Three studies are briefly noted.

*The nutritional requirements of rabbits*, A. G. Hogan and W. S. Ritchie.—It was found impossible to rear rabbits to maturity on synthetic diets supplemented with carrots. Extracting carrots with hot alcohol and evaporating to a small volume and adding to the basal diet enabled rabbits to survive for a longer period of time and to make considerable gains in weight.

*Nutrition of poultry*, A. G. Hogan and R. V. Boucher.—In these studies an effort was made to obtain the active agent of yeast in more concentrated form by electrodialysis. At the end of this procedure the anode and cathode fractions were brought to approximate neutrality with sodium hydroxide and hydrochloric acid, respectively. The material from the anode compartment has shown considerable activity both in accelerating growth and in preventing leg weakness. The material from the cathode compartment was more uncertain. Both salts, however, were quite toxic when given in any considerable amount.

*Growth investigations*, A. C. Ragsdale, S. Brody, W. C. Hall, and U. S. Ashworth.—Continuing this study (E. S. R., 63, p. 760), it was found that the energy metabolism of half-fed animals was about 25 per cent below normal animals, while those on a high plane of nutrition had a metabolism about 20 per cent above normal animals. Fasting resulted in a progressive decline in energy metabolism, decreasing about 40 per cent from the initial value after fasting 48 hours. However, the decline was insignificant between 48 and 72 hours of fast. Although the energy wastage increased with an increase in food intake, the larger the food intake the less the heat wastage per unit of gain in young animals.

During the first week of life of dairy calves the heat production was 1,000 calories per square meter. This production increased with age so that at 4 months of age the metabolism 12 hours after feeding was about 1,800 calories per square meter, and at 70 hours after feeding it was about 1,400 calories. With pigs the metabolism declined from about 1,400 calories 12 hours after feeding to 900 calories 30 hours after feeding, while in lambs it dropped to about 1,100 calories 40 hours after feeding, and in standing colts to 1,600 calories 40 hours after feeding. Up to a weight of 120 kg., the metabolism per unit area was greater in females than in males, but the reverse was true above this weight. Oestrum did not appreciably increase metabolism.

In dairy calves fed normally about 82 per cent of the total nitrogen was urea plus ammonia nitrogen, while the creatinine nitrogen was about 10 per cent and creatine nitrogen almost as much. The urinary nitrogen excreted by these calves was about 0.3 gm. per kilogram of body weight, and this was about 10 times that excreted on a nitrogen-free ration. About 20 mg. of creatinine was excreted per kilogram of body weight. The creatinine excretion increased faster than the energy metabolism with increasing body weight.

**Commercial feeding stuffs, 1930–1931**, J. M. Bartlett (*Maine Sta. Off. Insp. 140, (1931), pp. 17–48*).—This is the usual report of the analyses guaranteed and found of 695 samples of feeding stuffs collected for official inspection during the year ended June 30, 1931 (E. S. R., 64, p. 163).

**Beef cattle investigations, 1930–31** (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1930–31, pp. 2–8*).—The results of four tests, two of which have been continued (E. S. R., 63, p. 362), are reported.

*The comparative value of kafir fed to stock cattle in the forms of dry fodder, chopped fodder, ground fodder, and silage.*—In this test four lots of 10 yearlings each, averaging 721 lbs. per head, were fed for 150 days. All lots received cottonseed cake at the rate of 1 lb. per head daily. In addition the respective lots received whole, chopped, and ground kafir fodder, and kafir fodder silage. The average daily gains were 1.1, 1, 1, and 1.3 lbs. per head, respectively. The chopped fodder produced 3.72 per cent more gain per acre than the whole fodder. Kafir fodder produced 75.2 and 67.3 per cent, respectively, more gain per acre than whole or ground fodder.

*The comparative value of corn silage, kafir silage, and Atlas silage.*—Calves averaging 426 lbs. per head were divided into three lots of 10, 9, and 7 head and were fed for 150 days. All lots received 1 lb. of cottonseed cake and the respective lots were fed kafir silage, Atlas silage, and corn silage. The average daily gains were 1.1 lbs. per head in all lots. The average gain per ton of silage fed was 64.4, 62.6, and 64.3 lbs., respectively.

*Corn silage v. ground corn fodder as roughages for stock cattle.*—Two lots of 7 and 9 calves each, averaging 426 lbs. per head, were fed 1 lb. of cottonseed cake per head per day and either corn silage or ground corn fodder for 150 days. The average daily gains were 1.1 lbs. per head in both lots. An acre of corn in the form of silage was found to be equal to 1.63 acres of corn in the form of dry fodder. The yield of corn fodder was 1.82 tons and of silage 5.72 tons per acre.

*The comparative value of ground wheat and cottonseed cake as supplements for kafir hay fed to stock cattle.*—In this test two lots of 10 calves each, averaging 422 lbs. per head, were fed for 150 days on a basal ration of kafir hay. In addition one lot received 2 lbs. of ground wheat and the other 1 lb. of cottonseed cake per head daily. The average gains were 0.8 and 0.7 lb. per head daily. The average gain per ton of feed offered was 100.6 and 83.8 lbs. in the respective lots. The 2 lbs. of ground wheat proved to be worth approximately 20 per cent more than 1 lb. of cottonseed cake as a supplement to kafir hay for stock calves.

**[Beef cattle experiments at the Missouri Station]** (*Missouri Sta. Bul. 300 (1931), pp. 51, 52, 53–56, fig. 1*).—The results of several studies, most of which have been continued (E. S. R., 63, p. 762) are noted. The first two were in cooperation with Sni-A-Bar Farms and the U. S. Department of Agriculture.

*Fattening fall calves by feeding grain while they are suckling and for 168 days after weaning*, E. A. Trowbridge, H. C. Moffett, and E. M. Jones.—Twenty-five steers 60 days old out of high grade Shorthorn cows and sired by purebred Shorthorn bulls were divided into three lots. Lot 1 ran with their dams and received no grain. Lot 2 ran with their dams and had access to grain and alfalfa hay in creeps, and lot 3 was kept on a pasture with access to grain and hay and suckled twice a day. At weaning time the calves were placed in dry lot and were fed corn, linseed meal, and alfalfa hay. At the end of the suckling period the calves in the respective lots had gained 197, 305, and 344.8 lbs. per head. At the end of 168 days in dry lot the gains were 315, 288, and 288 lbs. per head in the respective lots.

*Rations for fattening native spring calves*, E. A. Trowbridge, H. C. Moffett, and E. M. Jones.—High grade Shorthorn calves were divided into three lots of 12 head each, and during the suckling period while running with their dams on bluegrass pasture the respective lots were self-fed the following rations in creeps: Shelled corn; shelled corn and cottonseed cake 8:1; and shelled corn and oats 2:1. At the end of the suckling period the calves were continued on the same rations in dry lot and in addition received alfalfa hay and for part of the period silage. The ration fed in lot 2 during the suckling period increased the feed consumption, daily gains, and market value. The use of oats in lot 3 increased the feed consumption without increasing the rate of gain. During the dry lot period the respective rations produced gains of 325, 291, and 320 lbs. per head, but the calves in lot 2 were fattest at the end of this period.

*Fattening steer and heifer calves*, E. A. Trowbridge, H. C. Moffett, and E. M. Jones.—One lot of spring heifer and steer calves were creep-fed during a suckling period of 140 days on grass and were then fed for 196 days in dry lot on shelled corn and cottonseed cake 8:1, alfalfa hay, and corn silage. During the suckling period the steers and heifers made average daily gains of 2.2 lbs. per head. The heifers ate 15 per cent more grain, appeared fatter, but had the same market value at the end of this period as the steers. At the end of 336 days the steers had gained 595 lbs. and the heifers 578 lbs. per head. This project was in cooperation with Sni-A-Bar Farms.

*Wintering beef calves*, E. A. Trowbridge and H. C. Moffett.—Hereford calves were divided into 6 lots of 8 head each, and all lots were fed a mineral mixture. The calves in lot 1 made an average daily gain of 1.1 lbs. per head on a daily ration of 3.6 lbs. of shelled corn, 0.45 lb. of cottonseed cake. 4.5 lbs. of clover hay, and 13.4 lbs. of silage. Lot 2 calves gained 1.1 lbs. per head daily on 4.2 lbs. of corn and 8.9 lbs. of clover hay. In lot 3, 4.9 lbs. of corn, 0.7 lb. of cottonseed cake, and 7.8 lbs. of timothy hay produced an average daily gain of 1.1 lbs. per head. The calves in lots 4, 5, and 6 were well maintained on rations of 5 lbs. of clover hay and 16.3 lbs. of corn silage; 11.5 lbs. of clover hay; and 3 lbs. of corn, 0.37 lb. of cottonseed cake, and 10 lbs. of timothy hay, respectively.

*Fattening yearling steers*, E. A. Trowbridge and H. C. Moffett.—Grade steers, part of which had been wintered liberally and part on limited rations, were again divided into three equal groups at the beginning of the pasture season. One group of each lot was full-fed corn and cottonseed cake on grass for 168 days, the second group was half full-fed for 56 days and then full-fed for 112 days, while the third group was grazed 56 days without grain and full-fed for 112 days. The cattle wintered liberally were fatter and larger than the other lot at the beginning of the pasture season, but the latter animals gained approximately 20 lbs. more during the summer feeding period and also made summer gains with from 5 to 10 per cent greater economy. The fleshy yearlings grazed 56 days without grain gained 56 lbs. during the period, while the thinner cattle made 20 per cent greater gains. The cattle wintered liberally were ready for market after 60 days' full feeding on grass, while the other lot required from 100 to 120 days to make good slaughter cattle. The cattle wintered on limited rations grazed for 56 days without grain and full-fed for 112 days sold as slaughter cattle, but would have returned more profit had they been fed from 30 to 60 days longer. The long period of full feeding on grass made creditably fat cattle of the animals regardless of the manner of wintering.

**Alfalfa hay and small grains for fattening yearling steers**, L. VINKE and P. PEARSON (*Montana Sta. Bul. 251 (1931), pp. 24, figs. 5*).—In concluding this study two tests not previously noted (E. S. R., 64, p. 252) are reported.

In the 1929–30 test 1 lot of 9 and 4 lots of 10 yearling steers, averaging 755 lbs. per head, were fed for 140 days. All lots were full-fed alfalfa hay and in addition the respective lots received a full feed of wheat, oats to full feed and barley thereafter, barley, barley and oats, and barley and cull peas. The average daily gains in the respective lots were 2.2, 2.3, 2.3, 2.2, and 2.4 lbs. per head. The steers in lot 1 made the most economical gains, followed in this respect by lots 5, 3, 4, and 2. The finish as indicated by selling price was highest in lot 5, followed by lots 3, 4, 2, and 1.

The 1930–31 test was conducted with 4 lots of good quality steers averaging 873 lbs. per head and 1 lot of common steers averaging 725 lbs. per head. There were 10 head of animals in each lot, and they were fed for a period of

150 days. All lots received a full feed of alfalfa hay and in addition lot 1 received barley. The remaining lots were started on oats and finished on barley, wheat and cull peas, wheat, and wheat respectively. The average gains in the respective lots were 2.1, 2.2, 2.6, 2.4, and 2 lbs. per head. The steers in lot 3 made the most economical gains, followed in descending order by lots 4, 5, 2, and 1. The finish as indicated by selling price was highest in lot 3, followed by lots 4, 2, 1, and 5, respectively.

Based on these trials it was concluded that yearling steers could not be fattened on alfalfa hay alone. In these tests the more grain fed the greater were the gains, selling price, and profit, but the higher was the cost per steer. Unless oats were considerably lower in price than barley, it was more practical to feed barley alone with alfalfa hay. Frosted wheat or low-protein wheat which was not too old or hard was a better feed than barley when fed with alfalfa hay. Over a 5-month period steers fed hull-less barley made more rapid and economical gains and attained a higher finish than those fed wheat, but the hull-less barley was particularly unpalatable at the start of the feeding period. Cull beans were too laxative when fed in large amounts and when reduced to 20 per cent of the ration were of no value. Cull peas when priced no higher than the grain and fed in limited amounts increased the return for all feeds.

**Corn, wheat, and rye for fattening calves,** M. L. Baker (*Nebraska Sta. Bul. 263 (1931), pp. 11, figs. 5*).—In this study 5 lots containing 12, 11, 12, 11, and 10 calves, averaging 372 lbs. per head, were fed for 205 days on a basal ration of alfalfa hay. In addition the respective lots received shelled corn, ground wheat, ground rye, shelled corn and ground wheat equal parts, and shelled corn and ground rye equal parts. The average daily gains were 2.4, 2.2, 2.2, 2.4, and 2.3 lbs. per head in the respective lots.

The grain ration fed in lot 4 was practically equal in all respects to shelled corn. The combination of corn and ground rye was 95 per cent as efficient as shelled corn on the basis of average daily gains, and the selling price, dressing percentage, and carcass grades of calves fed this mixture was slightly lower than for calves fed corn. Ground wheat and ground rye were equally palatable, but neither was equal to corn in this respect. On the basis of average daily gains, ground wheat was 91 per cent and ground rye 90 per cent as efficient as corn. The wheat-fed steers produced higher grade carcasses and sold at somewhat higher prices than the rye-fed steers, but neither of these lots equaled the lots receiving corn in dressing percentage or carcass yields. There was little difference between the lots in economy of gains. No digestive disturbances which could be attributed to the use of wheat or rye were encountered.

**[Meat investigations in Missouri]** (*Missouri Sta. Bul. 300 (1931), pp. 52, 53*).—These studies have been continued (E. S. R. 63, p. 761).

*The influence of feeding on carcasses from steers and heifers*, E. A. Trowbridge, H. C. Moffett, M. T. Foster, W. S. Ritchie, and J. A. Cline.—In this study slaughter and cooking data showed that yearling steers or heifers full-fed for 196 days in dry lot made choice slaughter cattle and yielded desirable carcasses. Similar animals fed a half-grain ration for the same period produced reasonably good beef. Steers fed roughage alone yielded carcasses that were thin and lacking in finish. The full-fed steers graded the same as full-fed heifers, but dressed higher, contained more lean and bone, and had a higher palatability score. Heifers fed a half-grain ration in dry lot for 168 days and then full-fed on pasture for 168 days dressed higher than steers similarly fed, but the carcasses were somewhat "cowy" in conformation, graded lower, contained more fat and yielded more palatable roasts. The percentage of fat in the eye muscle of heifer carcasses was twice that of steers handled in the same manner. There was no appreciable difference in the percentage of the loin and rib from corresponding steers and heifers. The percentage of round, chuck, and shank was higher in steer carcasses, while the percentage of flank was higher in heifer carcasses.

*The effect of age in producing beef from female cattle*, E. A. Trowbridge and H. C. Moffett.—A comparison was made of 5 fat 14-month-old heifers and 5 fat mature cows. On a ration of corn, cottonseed cake, corn silage, and clover hay the cows made average daily gains of 2.2 lbs. per head in 111 days, while the heifers gained 2 lbs. per head during 180 days. The heifers consumed 20 per cent more grain but 50 per cent less hay and only 10 per cent as much silage per 100 lbs. of gain as the cows. The carcasses of the heifers graded high good and low choice, while the cow carcasses graded good.

**Lamb feeding experiments, H. Hackedorn, J. Sotola, and H. P. Singleton** (*Washington Col. Sta. Bul. 258 (1931), pp. 16*).—Continuing these studies (E. S. R., 60, p. 856), the comparative feeding value of Washington-grown and eastern No. 3 corn depended upon the moisture content and the physical condition of the corn. There was no difference in the feeding value of eastern No. 3 and locally grown yellow corn when both contained about 17 per cent of moisture. Hard winter or spring wheat grown under dry land conditions, eastern Washington-grown heavy barley, and oats had about the same feeding value, but none was equal to corn. Dakota-grown spelt was not so valuable as local grains. In one test steam rolling barley increased its feeding value, while grinding had no beneficial effect. Ground wheat was inferior to whole wheat, but ground oats was somewhat better than whole oats. Chopping or grinding hays, while not increasing the consumption, reduced the amount of waste. Lambs refused 22 per cent of long hay, 3 per cent of chopped hay, and none of the ground hay offered. Cull potatoes were found to be the most valuable succulent feed, followed by corn silage, with cull apples and carrots last.

**Feedlot fattening rations for lambs, G. E. Morton, E. J. Maynard, and B. W. Fairbanks** (*Colorado Sta. Press Bul. 76 (1931), pp. 19, fig. 1*).—This study was continued (E. S. R., 64, p. 552), using the same plan of feeding for the second year with 15 lots of 23 lambs each for 106 days.

Based on the results of these two trials it was found that 1 ton of shelled corn fed with alfalfa hay and compared with whole barley and alfalfa hay replaced 1,982 lbs. of barley and 283 lbs. of alfalfa. At the usual prices prevailing for the grains, barley was a satisfactory and economical feed. Barley produced a better finished lamb when fed with wet beet pulp. When whole barley was worth $22.50 per ton and alfalfa hay $11.25 per ton, cull potatoes showed a feed replacement value of $4.56 per ton. At the above prices for barley and alfalfa, cull potatoes and corn fodder silage consisting of 82 per cent of potatoes and 18 per cent of dry corn fodder had a feeding value of $6.21 per ton. Wet beet pulp fed with whole barley and alfalfa hay produced the fattest lambs at the lowest cost per unit of gain of the rations tested. At a cost of $2.10 per ton, wet beet pulp had a feed replacement value of $3.22 per ton.

The addition of a nitrogenous supplement to the rations compared proved to be profitable when the values of the feeds it replaced exceeded the cost of the nitrogenous concentrate. The feed replacement value of cottonseed meal for various rations has been computed, and its profitable use can be calculated. The four molasses feeds ranked in value in the following order: Final discard beet molasses, Steffens discard beet molasses, foreign beet molasses, and cane molasses.

**Colorado drylot fattening rations for lambs, E. J. Maynard, G. E. Morton, and H. B. Osland** (*Colorado Sta. Bul. 379 (1931), pp. 64, figs. 15*).—This bulletin summarizes the results of lamb feeding experiments conducted at the station during the past 10 years, a portion of which is included in the above. These studies were conducted to determine the relative values of home-grown feeds and by-products available to Colorado lamb feeders and also standard lamb-fattening rations for different sections of the State.

**[Swine studies in Missouri]** (*Missouri Sta. Bul. 300 (1931), pp. 49–51*).—These two studies have been continued (E. S. R., 63, p. 763).

*The adequacy of commercial feedstuffs for swine reproduction*, A. G. Hogan and J. G. Cottier.—In this study four lots of four sows each were used. One lot received a ration similar to that used in a previous study, the second lot received a ration containing a larger percentage of protein, the third lot a large amount of protein and, in addition, wheat shorts and a liberal quantity of alfalfa meal, and the fourth lot was fed as in lot 1, but at farrowing time was placed on bluegrass pasture. In the first three lots two animals of each lot were given access to a small outside pen, but sunlight had no apparent effect on lactation, which was only partially satisfactory. The number of pigs weaned and their weights were not far below normal. A few sows failed to eat enough feed and did not produce liberal amounts of milk. The pigs in the first three groups did not have healthy skins and their coats were roughened, while the pigs in lot 4 were heavier and had a healthier appearance than those in lot 1, although their weights were low, probably due to an infestation of intestinal worms.

*Protein supplements for feeding hogs on pasture*, L. A. Weaver.—Eight lots of pigs were fed on Sudan grass pasture with corn and a mineral mixture as the basal ration. When no protein supplement was fed, the pigs made smaller gains and required more feed to produce a unit of gain than when a supplement was given. Tankage as the sole supplement produced as rapid gains, and no more feed was required per unit of gain than when a more complicated supplement was fed. In general the higher the percentage of protein in the supplement the better were the results secured. A ration of corn and tankage 16:1 produced as rapid and more economical gains than one of corn and tankage 12:1.

**Food requirements of pregnancy in swine, H. H. Mitchell, W. E. Carroll, T. S. Hamilton, and G. E. Hunt** (*Illinois Sta. Bul. 375 (1931). pp. 465–504, figs. 8*).—Concluding this study (E. S. R., 62, p. 365), it was found that male fetuses averaged heavier in weight than female fetuses in 11 of the 15 litters in which sex was determined. The mean percentage difference between sex averages for these litters was 5.5±1.4. The chemical analyses of the fetus samples showed a progressive increase in percentage of dry matter as fetal age increased. In order to get a more thorough and complete description of the amounts of nutrients contained in the total products of conception at succeeding stages of gestation, the chemical data were carried to a uniform litter size of 8 and fitted to the equation $W=kt^n$, in which $W$ is the weight of a given constituent deposited at time $t$ in the uterus. From this equation a table was prepared showing the weights of the various constituents deposited in the uterus at different stages of gestation.

Balance experiments on 5 of the 16 gilts showed that they were storing nutritive material in their bodies at a much faster rate than they were depositing such material in the uterus. The average daily retentions of nitrogen, calcium, and phosphorus throughout gestation were 7.12, 4.38, and 1.32 gm., respectively, representing 17.8, 31.5, and 16 per cent of the intake of the respective nutrients. However, of the stored nutrients only 31 per cent of the nitrogen, 20 per cent of the calcium, and 40 per cent of the phosphorus was used in the processes of reproduction, the remainder providing material for the growth of the gilts. There was no tendency toward an increased retention of nutrients as pregnancy progressed.

**The value of peanuts for growing pigs,** J. O. Halverson, E. H. Hostetler, and F. W. Sherwood (*North Carolina Sta. Tech. Bul. 41 (1931), pp. 27, figs. 4*).—Concluding this series of studies (E. S. R., 55, p. 263) carried out over a period of 6 years in cooperation with other State experiment stations and the U. S. D. A. Bureau of Animal Industry, a total of 289 growing pigs were fed peanuts. The peanuts were supplemented with either mineral mixture, alfalfa meal, tankage or fish meal, or wheat shorts, of which the results showed that alfalfa meal and mineral mixture were the only supplements necessary to produce satisfactory daily gains. On such a ration there was an economical consumption of peanuts per unit of gain when fed to pigs with an average initial weight of 35 or 60 lbs. The addition of tankage or fish meal to the above ration had no apparent advantage, indicating that animal proteins were not necessary for adequate rate and economy of gains when the mineral and vitamin deficiencies of the peanuts were supplied. A statistical study of the individually fed pigs and of the relative importance of such factors as rate and economy of gain in lot-fed pigs substantiated the above deduction.

**and of cottonseed meal, both alone and in combination with the proteins**

**The nutritive value for growing swine of the proteins of linseed meal of corn,** H. H. Mitchell and T. S. Hamilton (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 8, pp. 743–748*).—The results reported in this paper from the Illinois Experiment Station are more detailed accounts of work previously noted (E. S. R., 66, p. 258).

**Wheat for fattening hogs,** W. J. Loeffel (*Nebraska Sta. Bul. 261 (1931), pp. 19, figs. 2*).—In four tests pigs fed wheat (E. S. R., 54, p. 365) consumed more feed daily than similar pigs fed corn. In all but one of these tests the pigs receiving wheat gained more rapidly than those fed corn. In one trial whole wheat self-fed with tankage in dry lot proved to be 2.5 per cent more efficient than corn pound for pound. In another test whole wheat hand-fed on pasture was only 79 per cent as efficient as corn. Coarsely ground wheat was 7 per cent more efficient in one test and 99 per cent as efficient in another test per unit of weight as corn in dry lot. On Sudan pasture ground wheat was 98 and 102 per cent as efficient as corn in two trials. For all the tests a bushel of coarsely ground wheat properly supplemented produced 15 lbs. of pork. When wheat was fed less protein supplement was required than when corn was fed.

When hand-feeding was practiced it was desirable to grind wheat coarsely, but when whole wheat was self-fed pigs apparently masticated it enough to prevent excessive waste. Soaking did not materially increase the feeding value of either whole or ground wheat. While wheat contained more protein than corn it was not a balanced ration, and for best results some high protein feed should be combined with it. The meat produced by wheat-fed hogs was equal in quality and palatability to that produced by corn-fed hogs, and the wheat-fed pigs were found to be a little firmer than those fed corn.

**Studies of rickets in swine,** W. L. Loeffel, R. R. Thalman, and F. C. and F. A. Olson (*Nebraska Sta. Research Bul. 58 (1931), pp. 67, figs. 12*).—A series of four experiments was conducted to study the importance of the antirachitic factors, cod-liver oil and radiant energy of sunlight, in the nutrition of swine. Emphasis was placed upon the study of the symptoms and lesions which occurred when a ricket-producing ration was fed. The results of the first trial were inconclusive, but demonstrated the suitability of the pig as an experimental animal subject and also that growth was essential to the development of rickets.

The basal ration selected for the last three trials consisted of yellow corn, soybean oil meal, blood meal, powdered skim milk, and salt. Pigs fed the basal ration only and confined out of direct sunlight failed to grow and develop normally. The first symptoms of rickets appeared among these pigs from 5 to 8 weeks after the beginning of the experiment. The abnormalities noted were not confined to any one part of the body, but the most noticeable signs of rickets were found in the skeleton. Some pigs were affected sooner than others, but when rachitic symptoms did occur in older pigs a very rapid collapse followed. Growth, though necessary for the development of rickets, was found to be largely controlled by rickets.

Antemortem examination was a valuable aid in diagnosis, but the post-mortem examination revealed softened and deformed bones, the "rachitic rosary," joint erosion, fractures, and other characteristic abnormalities. Macroscopic study of split bones revealed more accurately the nature of the lesions, which were generally increased cartilagenous material, widening and separation of the epiphyseal lines, thin and softened bone shell, and excessive amounts of fibrous or osteoid tissue. X-ray pictures of the humerus could usually be depended upon to show evidence of rickets.

Sunlight and cod-liver oil in trial 1 and sunlight alone in trial 2 prevented rickets and produced a blood calcium-phosphorus content more than twice as high as that in the pigs receiving the basal diet only. Analysis of the blood for alkali reserve was found to be of little value in the diagnosis of rickets. The addition of the antirachitic factors in trials 1 and 2 produced bones significantly higher in ash content than did the basal ration, but these findings were not borne out in trial 3, indicating that ash analysis could not be relied upon in determining rickets. The breaking strength of the tibiae of rachitic pigs was reduced more than half, the most affected pigs having the weakest bones. It was found that breaking strength calculated per unit of bone area was a more reliable measure of breaking strength than the actual stress required to break the bone.

In trial 3, cod-liver oil fed at the rate of 0.75 per cent of the basal diet did not prevent mild rickets in pigs fed indoors, but when the cod-liver oil was increased to 1 per cent recovery of those pigs already affected took place and further trouble from rickets was prevented. Severe rickets developed in a group of similar pigs receiving the same ration but denied both direct sunlight and cod-liver oil.

**Growth and development of draft colts,** E. A. Trowbridge, D. W. Chittenden, and S. Brody (*Missouri Sta. Bul. 300 (1931), p. 46*).—Percheron colts were divided into two lots at weaning time and were fed from September 10 for a period of 249 days. Lot 1 received all the hay they would consume twice daily, while lot 2 had its hay and grain ration limited to one-half that of lot 1. The method of feeding in lot 2 was unsatisfactory, and on January 3 this lot had all the hay they would consume twice daily. Two of the colts in lot 1 became slightly foundered and went off feed, but there was no sickness in lot 2. At the end of the test the colts in lot 1 carried more flesh and had gained slightly more in height at withers and rump and in depth of chest than those in lot 2, but the latter colts made satisfactory gains in weight and growth.

**[Poultry studies in Missouri]** (*Missouri Sta. Bul. 300 (1931), pp. 92–94*).—Some of these studies have been continued (E. S. R., 63, p. 765).

*The feed purchasing power of the eggs laid by one hen*, H. L. Kempster.—The feed purchasing power of eggs in 1929 was nearly 13 per cent higher than for the previous year.

*Normal growth of chicks*, H. L. Kempster and E. E. Schnetzler.—Rhode Island Red and White Rock chicks hatched in February were consistently larger at a given age than those hatched later. There was little difference in the growth rates of chicks hatched in March and April. White Leghorn chicks hatched in February outweighed those hatched in March and April up to 28 weeks of age, but after this time the advantage disappeared as age increased. With Rhode Island Reds and White Rocks at 40 weeks of age there was a difference of about 1 per cent in favor of the progeny of mature birds as compared with the progeny of pullets.

*Wheat as a supplement to yellow corn in rations for egg production*, H. L. Kempster.—In this study it was found that the egg production of hens increased as the percentage of wheat and wheat products in the scratch and mash ration increased up to the point where the ratio between corn and wheat was equal.

*Nutritional requirements of poultry*, E. E. Schnetzler.—A basal ration of yellow corn meal, wheat bran, wheat middlings, bone meal, salt, and cod-liver oil was fed to 6 lots of 20 White Leghorn chicks each. The respective lots received the following supplements: 5 per cent of dried buttermilk and 3.2 per cent of bone meal; 15 per cent of dried buttermilk and 2.4 per cent of bone meal; 25 per cent of dried buttermilk and 1.6 per cent of bone meal; 10 per cent of meat scrap, 5 per cent of dried buttermilk, and 8 per cent of bone meal; 5 per cent of meat scrap, 10 per cent of dried milk, and 1.2 per cent of bone meal; and 15 per cent of meat scrap. The average gain to 7 weeks of age was 272, 331, 395, 291, 359, and 262 gm. in the respective lots.

**The care and management of the small poultry flock, C. S. Platt** (*New Jersey Stas. Hints to Poultrymen, 20 (1931), No. 1, pp. 4, fig. 1*).—Suggestions on the housing, feeding, and management of the small poultry flock are given.

**Variability of shell porosity in the hen's egg, H. J. Almquist and W. F. Holst** (*Hilgardia [California Sta.], 6 (1931), No. 3, pp. 61–72, figs. 5*).—A method developed for determining eggshell porosity consisted of immersing the egg for 2 minutes in a solution of methylene blue in 95 per cent alcohol. After immersion the egg was allowed to dry. The shell was then carefully split into halves, the contents poured out, and the inside of the shell wiped dry. A clear and permanent picture of the porosity of the shell remained. A large number of shells examined for porosity in this manner were selected and given arbitrary numbers for use as a set of standards.

Eggs from a group of more than 50 hens were stored from 5 to 6 days at 86° F. and at constant humidity. Loss of weight was determined by accurate weighings and expressed as percentage of fresh weight lost per egg per day. Porosity numbers were assigned as described above. The two determinations were conducted separately and brought together, calculated to a common basis, and compared. The eggs used showed wide differences with respect to shell characteristics, such as thickness and smoothness.

It was found that the shell porosity in fresh eggs, namely, the initial porosity, was with a few exceptions low. The eggshells were subject to changes in porosity during storage, often increasing during this period, especially rapid at higher temperatures. The porosity approached a maximum which was approximately uniform for all eggs with regard to degree and distribution. Porosity was practically uniform for the eggs of an individual hen, but showed differences among birds. In fresh eggs the porosity was rather uniformly distributed and was not generally greater in the air-space region.

**Distribution of solid matter in thick and thin egg white, W. F. Holst and H. J. Almquist** (*Hilgardia [California Sta.], 6 (1931), No. 3, pp. 45–48, fig. 1*).—Since watery whites are objectionable in market eggs and frequently result in a lowering of grade and price of eggs, this study was undertaken to obtain information which would explain the progressive liquefaction that often occurs in stored eggs. The method followed was to dry 2-gm. samples of liquid white and to compare the solids content of such whites with the solids content of normal whites.

It was found that the percentage of solids was the same in thick and thin whites in the same egg, whether the egg was old or fresh. This conclusion was supported by the fact that the refractive indexes were practically the same. The solids content of fresh eggs varied generally between 10.7 and 12.9 per cent with extremes as low as 9.6 and as high as 13.5 per cent. The concentration of water in thick and thin whites remained the same regardless of losses to the yolk or through the shell.

**Measurement of deterioration in the stored hen's egg,** W. F. Holst and H. J. Almquist (*Hilgardia* [*California Sta.*], *6* (*1931*), *No. 3*, *pp. 49–60*, *figs. 4*).—In the first part of this article the authors describe two methods of measuring the deterioration of eggs during storage. The first method consisted of determining the changes in the yolk and the second method changes in the thick white. The latter method was selected for this study since it gave better evidence of the initial fresh condition of eggs, was simpler and speedier in operation, there was less danger of losing the measurements, it was not necessary to make measurements in a specified time after the egg was open, and it was independent of shrinkage. The method consisted of determining the percentage of thick white present.

During the experimental period storage was carried out at temperatures of either 64 or 86° F., with humidity kept constant and the carbon dioxide removed by a 15 per cent solution of sodium hydroxide. At the lower temperature data were taken at approximate 5-day intervals over a total period of 25 days, while at the higher temperature the data were taken at 2-day intervals over a 10-day period. The work was broken up into a series of studies of the eggs from individual birds, distributed among the various storage periods.

The results of the study show that shrinkage has little significance as an index of egg quality. Liquefaction changes in the thick white and yolk of stored eggs occur simultaneously or not at all. The intrinsic keeping quality of an egg is decidedly a function of the individuality of the hen.

**The significance of measurements of quantity and quality of egg yield,** W. C. Thompson, D. Philpott, and H. C. Page (*New Jersey Stas. Bul. 528* (*1931*), *pp. 40*, *figs. 8*).—Based on the records of the Vineland, Passaic County, and Hunterdon County egg-laying contests, this study was undertaken to determine methods for improving both quantity and quality of production. The study was divided into the following parts: (1) Quantity egg production, (2) short-period trap nesting, (3) quality egg production, and (4) the relationship between monthly and annual egg weights during the pullet year of Single Comb White Leghorns.

An analysis of the data led to the conclusion that the mean percentage of first-grade eggs during any of the months of maximum numerical production (March, April, or May) showed an intimate relationship with the mean percentage of first-grade eggs for the year. The annual production of first-grade eggs could be predicted with a fair degree of accuracy from the percentage of such eggs laid during these months. Individual weights of all eggs produced during months of maximum production were a practical and reliable means of estimating the annual egg weight of the bird. Since artificial lighting influenced egg weight, it was recommended that a careful study be made of its effects.

**New Jersey egg-laying contests for 1930–31,** J. W. Goodman (*New Jersey Stas. Hints to Poultrymen*, *20* (*1931*), *No. 2*, *pp. 4*, *fig. 1*).—A report of the results of the fifteenth year of the Vineland egg-laying contest, the third year of the Passaic County contest, and the second year of the Hunterdon County contest (E. S. R., 64, p. 470).

## DAIRY FARMING—DAIRYING

**[Experiments with dairy cattle at the Missouri Station]** (*Missouri Sta. Bul. 300 (1931), pp. 59–61, 64*).—Most of these studies have been continued (E. S. R., 63, p. 767).

*The individuality of the four quarters of the cow's udder*, C. W. Turner.—Using a special milking machine which kept the production of milk from each quarter separate, 46 records were made on 35 cows during weekly periods of three milkings daily each fourth week during lactation. Approximately 20 per cent of the total yield was produced by each fore quarter and 30 per cent by each rear quarter. The production of the right and left half was practically the same. One lactation test was not necessarily a good indication of the next lactation's production by quarters. In most cases there was considerable uniformity in persistency of secretion.

*A comparison of the blood sugar content of the jugular and mammary vein as a measure of mammary gland activity*, C. W. Turner and H. Herman.—A study of the blood in the jugular vein and that of the mammary vein gave evidence that the precursors of milk are removed from the blood stream. Blood phosphatids, amino acids, and blood sugar were removed by the mammary gland. The blood sugar content was reduced nearly 25 per cent. In lactating cows the sugar content of the jugular vein was about 52 mg. per 100 cc. of blood, while the mammary vein contained from about 35 to 40 mg. of sugar. There was practically no difference in the sugar levels in nonlactating cows. Usually there was a greater variation between jugular and mammary blood sugar of high- than of low-producing cows. The normal blood sugar level in the jugular vein did not appear to vary, and the level in the jugular and mammary vein approached a common level when the udder was filled with milk. Pumping air into the udder or not milking for 24 hours produced a rise in both jugular and mammary blood sugar, due to lactose absorbed from the udder.

*The normal blood sugar values of dairy cattle*, C. W. Turner and H. Herman.—Based on over 150 samples of blood drawn from the jugular vein of about 75 animals, it was found that for normal lactating cows there were about 52 mg. of blood sugar per 100 cc. of blood, for nonlactating cows from 60 to 75 mg., and for bulls and open heifers from 60 to 85 mg.

*The calcium content of blood in dairy cows*, C. W. Turner and H. Herman.—The blood calcium of bulls and nonpregnant heifers was found to be from 10 to 11 mg. per 100 cc. of blood serum. For cows in high milk production the level was about 10 mg., indicating that calcium removed from the blood stream by the mammary gland was too small to be accurately measured. Disturbances of blood calcium took place from 6 to 36 hours after calving. In three cases there was a lowering of from 10 to 25 per cent, while in one case there was a rise of nearly 10 per cent during this period. Feeding irradiated yeast to one cow caused a rise of 10 per cent in the calcium level. Ingestion of from 200 to 500 gm. of calcium gluconate by drench gave a temporary but pronounced rise of nearly 15 per cent. Analyses of blood samples from two cows affected with milk fever showed the serum calcium to be lowered from 15 to 20 per cent.

*Methods for evaluating and proving sires*, W. Gifford.—A study of 112 Holstein sires with 20 or more tested daughters indicated that a sire should have 10 or more daughters with yearly records in order to predict the average records of 10 or more future daughters with reasonable accuracy. A further study of 23 Holstein and 20 Guernsey sires with 20 or more daughter pairs showed that the average of the sire's daughters, without considering the dam's production, more nearly predicted the average of the group than did several proposed indexes.

*Production records of show ring cattle*, W. Gifford.—An analysis of the records of 497 female Guernseys exhibited at the National Dairy Show showed that there was no significant relationship between show ring placings and yearly butterfat records.

**The influence of number of daily milkings on the production of dairy cows**, R. F. Morgan and H. P. Davis (*Nebraska Sta. Research Bul. 59 (1931), pp. 27*).—Cows of the four leading dairy breeds in the university herd were divided into age classes, and a record was kept of the milk production of cows milked two, three, and four times daily.

Analysis of these records showed that high-producing Holstein, Jersey, Ayrshire, and Guernsey cows of different ages milked three times daily produced from 39.69 to 52.26 per cent more fat and from 44.98 to 65.18 per cent more milk than cows milked twice daily. The cows milked four times daily produced from 110.19 to 127.53 per cent more fat and from 149.08 to 160.31 per cent more milk than those milked twice daily, and from 44.7 to 59.81 per cent more fat and from 51.99 to 71.79 per cent more milk than cows milked three times daily. The additional daily milkings tended to increase the percentage of fat in the milk. The influence of additional milkings was greatest when carried through the entire lactation period.

**Length of calving interval and average milk yield**, W. L. Gaines and J. R. Palfrey (*Jour. Dairy Sci., 14 (1931), No. 4, pp. 294–306, figs. 2*).—Data, based on the records of 186 Red Danish cows, starting with the cow's first calving and continuing uninterruptedly through the nine following calvings, all normal, were analyzed at the Illinois Experiment Station to determine the effect of the length of the calving interval with respect to both the current and following lactations. Yields were considered on an energy basis in terms of 4 per cent milk.

The results of the analyses showed that there was uniformly a negative correlation between calving interval and yield over the current calving interval, and a positive correlation between calving interval and yield over the following calving interval. However, the relation was irregular and the coefficients of correlation were small in value. Using all the calving intervals except the first one, it was found that the correlation coefficient between calving interval and yield over the current interval was —0.134 ± 0.018 and over the following interval 0.142 ± 0.018.

The calving interval distribution showed a mean of 401 days, but had a pronounced mode between 350 and 370 days. This distribution indicated that the calving interval could be prolonged to 18 months without adversely affecting the average yield per day, considered over both the current and following intervals.

**Dietary factors influencing calcium assimilation.—XIV, The influence of mineral acids and sugar on the calcium metabolism of milking cows**, E. B. Hart, H. Steenbock, O. L. Kline, and G. C. Humphrey (*Jour. Dairy Sci., 14 (1931), No. 4, pp. 307–321*).—Continuing this series of studies (E. S. R., 63, p. 364) at the Wisconsin Experiment Station, two experiments were undertaken to determine what factors in fresh green plant tissues favored calcium assimilation. The work was started on the hypothesis that probably in the fresh grasses there was a fairly high level of fermentable sugars, and that either these sugars by conversion into acids along the digestive tract aided calcium assimilation by virtue of holding the calcium in solution or that the sugars themselves increased the solubility of the calcium salts. The theory was tested by adding to the ration specific amounts of hydrochloric acid or Cerelose, a glucose preparation.

The results showed no consistent or favorable influences on calcium assimilation from the addition of 3 lbs. of Cerelose to a standard ration of hay, silage, grain, and protein supplements. Adding 115 or 230 cc. of 40 per cent hydrochloric acid increased the calcium excretion in the urine resulting in a greater net loss of calcium than when no acid was fed, even though the calcium absorption from the intestines was slightly improved through the use of the acid. These tests did not reveal the factor in green plant tissue which aids in better calcium assimilation.

**Calcium assimilation as indicated by bone analysis in long-time experiments,** A. M. HARTMAN and E. B. MEIGS (*Jour. Dairy Sci., 14 (1931), No. 4. pp. 322–336*).—A study of calcium assimilation over a long-continued feeding period under practical conditions was conducted by the Bureau of Dairy Industry, U. S. D. A. A ration consisting of timothy hay, a grain mixture, and corn silage (one cow received no silage) was fed to one grade Guernsey and three purebred Jersey cows for periods of from 14 to 32 months. Records were kept of the food consumed, the milk yielded, the weight of calves dropped, and the body weights of the animals. The hay used graded about U. S. No. 2. In order to get some idea of the extent to which the bones had been depleted of calcium after a long period on low calcium rations, the bones from one cow that had been on timothy for 30 months were compared in weight and chemical analyses with the bones of two other animals that had been on alfalfa for some time before slaughter.

The results of this study indicated that the relative amounts of ash, calcium, phosphorus, nitrogen, and organic matter in the bones of the cows were little, if any, altered by long periods on low calcium rations, even when a considerable amount of milk was produced during the period. The above method of feeding reduced the total weight of the bones from 10 to 12 per cent. The results also indicated that even on a fair quality of roughage over long periods under natural conditions, calcium assimilation tended to be somewhat higher than it was in most balance experiments, and that in the case of good cows this effect was intensified.

**Deficiencies in rations devoid of roughage for calves.—I, The effect of the addition of cod liver oil and alfalfa ash,** S. W. MEAD and W. M. REGAN (*Jour. Dairy Sci., 14 (1931), No. 4, pp. 283–293, figs. 3*).—This is a more detailed account of work previously noted (E. S. R., 65, p. 765).

Further data showed that a calf which had received milk to 6 months of age, but only concentrates thereafter, and a calf which received copper sulfate and ferric oxide in amounts sufficient to prevent nutritional anemia had bones low in mineral content. The animals making the greater gains in each group showed the lower percentage of ash in the dry fat-free bone. The caul fat of all animals appeared pure white. While lacking the usual fill, the digestive tracts of these animals were otherwise normal, and the dressing percentages averaged 57.4.

**Influence of relative vitamin value of milk on growth, digestion, nitrogen, and mineral metabolism in calves** [trans. title], E. G. SVESHNIKOVA (SWESHNIKOWA) (*Zap. Leningrad. Selsk. Khoz. Inst. (Mém. Inst. Agron. Léningrad), 7 (1929), No. 1, pp. 120–142; Eng. abs., pp. 140, 141*).—In a study at the

Leningrad Agricultural Institute, it was found that while the addition of cod-liver oil to the ration of a dairy cow increased the vitamin D content of the milk, it reduced the fat content and was not a profitable practice because of the depressing effect it had upon the utilization of the fat content of the feed. The milk of a cow fed a ration rich in vitamins produced average daily gains of 1.25 mg. on a rat fed 5 cc. of her milk daily, while milk from a cow on a ration poor in vitamins fed at the same rate produced gains of only 0.69 gm. daily. When the milk from the above-named cows was fed to suckling calves, the vitamin content had no effect on the rate of digestion or upon the nitrogen and mineral metabolism of the animals. The milk enriched with vitamin D produced no better growth with calves than ordinary milk.

**The percentage of fat as a basis for estimating the composition of milk,** O. J. Kahlenberg and Le R. Voris (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 8, pp. 749–755*).—A statistical analysis was made at the Pennsylvania Institute of Animal Nutrition on 184 samples of Holstein-Friesian milk in an effort to determine the relationship between the fat and total solids, solids-not-fat, protein, and energy. Each sample was a 28-day composite of aliquots of each milking of 12 cows for one entire lactation period. The samples were preserved in formaldehyde and were kept in glass-stoppered bottles at a temperature just above freezing.

The analyses showed the following correlation coefficients: Fat with energy, 0.9553±0.0058; fat with protein, 0.7027±0.0295; fat with total solids, 0.9089±0.0100; fat with solids-not-fat, 0.6919±0.0304. The multiple correlation coefficient for energy with fat and solids-not-fat was 0.985.

The regression equation of energy on fat was $E=128.55\ (1.886+f)$; of protein on fat, $P=0.8977+0.6393f$; of total solids on fat, $TS=1.783\ (3.47+f)$; for solids-not-fat, $t=0.7841\ (7.8903+f)$; for energy on fat and solids-not-fat, $E=183\ (3.04-0.31t+f)$.

**[Experiments with dairy products in Missouri]** (*Missouri Sta. Bul. 300* (*1931*), *pp. 65–68*).—The results of several studies, some of which have been continued (E. S. R., 63, p. 769), are noted.

*The causes of "sandiness" in nut ice creams*, W. H. E. Reid and M. E. Powell.—It was found that the presence of nuts, heat shocking of ice creams, and increasing amounts of milk solids-not-fat accelerated sandiness in ice cream. Sandiness was retarded by boiling, sugaring, autoclaving, and gelatinating the nuts before adding to the mix, and also by cocoa paste. Grape nuts did not affect sandiness. Alkali and acid in solution hastened final solubility of lactose and also quickened crystallization once it had started.

*Some factors influencing the properties of whipped cream with special reference to gelatin*, W. H. E. Reid and J. B. McCroskey.—In this study a cream containing 32 per cent of fat was found to produce a desirable whipped cream, while the addition of 0.6 per cent of gelatin produced a whipped cream of improved quality. For good results gelatin could be added by pasteurizing at 142° F. or by heating to 120° for 10 minutes. Gelatin increased the whipping time, decreased overrun, retarded drainage, did not affect the flavor, and gave a body with a watery luster. Added skim milk powder tended to decrease overrun, had little effect on drainage, produced a stiff, fluffy body, and imparted a slightly cooked milk powder flavor. Pasteurizing was harmful to the whipping properties of cream, but untreated pasteurized cream aged for 24 hours produced a good product. Adding agar to a whipped cream was unsatisfactory.

*Some factors affecting the physical properties of cream cheese, with special reference to gelatin*, W. H. E. Reid and M. N. Cowser.—Cream cheese having a fat content of 35 per cent when combined with 5 per cent of skim milk powder and 1 per cent of gelatin gave a very desirable product. Skim milk powder in amounts not exceeding 8 per cent of the total weight improved the body and texture of the cheese. The addition of from 0.5 to 1 per cent by weight of gelatin improved the body of cheese by making it stiffer, firmer, and smoother, and the texture by making it closer and finer. When cheese contained 30 per cent of fat, it was necessary to add 6 per cent of skim milk powder and 1 per cent of gelatin to secure the best consistency, texture, flavor, slicing, and spreading properties. At least 27 per cent of fat was necessary to furnish the desirable flavor and appearance, while gelatin and serum solids were added to furnish body and substance and to retain the serum in the cheese. Freezing cream cheese resulted in a broken body which tended to exude whey, and the flavor became buttery, oily, and rancid. The skim milk powder content tended to prevent surface extortion of frozen cheese more than the gelatin content. The fat content in suitable combination with gelatin and skim milk powder regulated the amount of free whey drainage more than did either the gelatin or skim milk powder content.

*The deodorization of cream for butter manufacture*, W. H. E. Reid and J. D. Rinehart.—In this study it was found that the intensity of the off flavor in the original cream determined the success of improving flavor score in resulting butter through the use of a deodorizer. Most of the deodorizers were successful in removing the off flavor of cream, but an objectionable chemical flavor resulted in some cases. A deodorizing temperature of from 80 to 90° F. appeared to be most satisfactory. There was a slight advantage to adding the deodorizer before standardizing the cream. All the deodorizers showed about the same germicidal properties. The deodorizers were able to remove successfully only the volatile flavors which volatilized upon the application of heat, the off flavors due to bacterial contamination or fermentation being removed only partially.

**The manufacture of low-acid rennet-type cottage cheese, H. L. Wilson and C. S. Trimble** (*U. S. Dept. Agr., Misc. Pub. 119 (1931), pp. 11, figs. 5*).—In this publication the quality of skim milk required, the equipment necessary, and methods for making and marketing low-acid rennet-type cottage cheese are given.

**Properties of some acid caseins, R. W. Bell and S. P. Gould** (*Jour. Dairy Sci., 14 (1931), No. 4, pp. 337–346*).—A number of samples of domestic casein were analyzed by the Bureau of Dairy Industry, U. S. D. A., to obtain information as to their properties. The samples were analyzed for appearance, fat, moisture, ash, strength, viscosity, and solubility. The results of these analyses, together with remarks as to their coating properties, are given in tabular form.

The authors discuss the various properties of casein and the correct methods of manufacturing casein of high quality.

## VETERINARY MEDICINE

**Textbook of special pathological anatomy of domestic animals, K. Nieberle and P. Cohrs** (*Lehrbuch der Speziellen Pathologischen Anatomie der Haustiere. Jena: Gustav Fischer, 1931, pp. VI+796, figs. 556*).—A textbook of pathology of the domestic animals, from which references to literature have been omitted.

**Dollar's veterinary surgery, J. J. O'Connor** (*Chicago: Alex. Eger, 1931, 2. ed., rewritten and ext., pp. IX+953, figs. 495*).—This is a second rewritten, abridged edition of a work, the first of a three-volume edition of which has been noted (E. S. R., 14, p. 491).

**Germicidal efficiency of mixtures of phenols with sodium hydroxide, with glycerin, and with ethyl alcohol, F. W. Tilley and J. M. Schaffer**

(*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 7, pp. 611–617*).—This contribution reports the results of experiments designed to show the influence of sodium hydroxide, of glycerin, and of ethyl alcohol upon the germicidal efficiency of phenols, and is in continuation of an earlier contribution which called attention to the influence of the soaps of coconut oil, castor oil, and linseed oil upon the germicidal efficiency of various phenols (E. S. R., 64, p. 473). The details of the work are reported in tabular form.

"Bacteriological tests were made with phenol, orthocresol, paracresol, thymol, orthophenylphenol, or hexylresorcinol in solutions containing sodium hydroxide, glycerin, ethyl alcohol, or soaps with glycerin or alcohol, against *Eberthella typhi* and *Staphylococcus aureus*. The addition, to solutions of phenol or cresol, of sodium hydroxide until it equaled or slightly exceeded the amount required for neutralization resulted in progressive diminution of germicidal efficiency. Large excess of sodium hydroxide tended toward an increase in germicidal power of the mixture because of the action of the free sodium hydroxide. Addition of sodium hydroxide to solutions of thymol caused very little decrease of efficiency until the amount of sodium hydroxide exceeded that required completely to neutralize the thymol. The addition of a large excess of sodium hydroxide caused a decided loss in efficiency. Glycerin acted to depress the germicidal efficiency of all the phenols tested, and the depression increased with increasing concentration of glycerin. Alcoholic solutions of the lower phenols were more efficient than aqueous solutions, but in most instances alcohol decreased the efficiency of the higher phenols. Soaps tended to counteract the depression of germicidal efficiency exerted by glycerin or ethyl alcohol."

**[Report of work in animal pathology at the Missouri Station]** (*Missouri Sta. Bul. 300* (*1931*), *pp. 103–105, fig. 1*).—In reporting upon further work with cecal abligation for blackhead of turkeys by A. J. Durant (E. S. R., 63, p. 376) it is pointed out that there are two things which prevent the practical application of this operation—(1) the fact that the mortality from the operation itself is high, and (2) abligated birds have developed an enlargement of the ceca in from 7 to 32 months after they are abligated. *B*[*acillus*] *coli communior* was found regularly present in pure cultures in the abligated ceca, and it is thought that this organism may have some definite etiological relation to the enlargement of these organs. In an effort to sterilize abligated ceca from 2 to 4 cc. of a 4 per cent solution of formalin was injected into the ceca immediately after they were abligated. Of the five birds so treated, one died as a result of the operation and the one receiving an injection of 4 cc. of the formalin solution was very ill, due to the use of such a large dose. The four surviving birds were kept under observation for periods ranging from 272 to 418 days, with no evidence of enlargement of the ceca. One of the four kept on a balanced diet and under favorable conditions from July 21 to March 24 was placed under unfavorable conditions on a poorly balanced diet and 38 days later died with all the symptoms of blackhead. An autopsy of this bird revealed that though it was completely abligated the stumps of the ceca were 25 mm. long and sufficiently pouched to hold a small amount of fecal material. In one of the pouches there were 15 small pieces of gravel and a typical ulcer of blackhead and several typical abscesses of blackhead were present in the liver. It is pointed out that in performing this operation the ceca should be separated from the main gut as near as possible to the latter organ.

In a further study of the resistance of abligated turkeys to blackhead, 2 of the 10 birds that had been continuously exposed to infection for a period ranging from 282 to 779 days died of blackhead. These birds are said to have been exposed to very unfavorable conditions of feed and environment.

In control work with infectious abortion of cattle and swine, by E. F. Sanders, agglutination tests were made on herds representing 90 counties, with a total of 2,069 positive reactions obtained from 10,437 samples. This method of control and eradication of the disease is said to have grown rapidly in favor. The results of the diagnosis made by Durant and H. C. McDougle of diseases represented in 5,227 specimens examined by the poultry and dog pathology laboratory are reported in tabular form.

**[Reports of the Imperial Institute of Veterinary Research, Muktesar, for the years ending March 31, 1928, 1929, and 1930]** (*Imp. Inst. Vet. Research, Muktesar* [*India*], *Rpts. 1927–28, pp. 28, pls. 9; 1928–29, pp. 26; 1929–30, pp. II+39*).—Included in these reports are accounts of the occurrence of and work with the more important infectious diseases of livestock. In the report for 1927–28, by J. T. Edwards, mention is made of a new fowl disease (pp. 14, 15), known as "Ranikhet disease," which is said to be quite similar to the Newcastle disease described by Doyle from England (E. S. R., 58, p. 77). The work carried out during the year 1928–29, by H. Cooper, with this disease (p. 14) indicated that it was probably identical with Newcastle disease. A summary of the work is given in the report for 1929–30.

**[Contributions on animal pathology]** (*Amer. Assoc. Med. Milk Comns.* [*etc.*] *Proc., 24* (*1930*), *pp. 103–115, 181–184, 282–320*).—The contributions here presented are as follows: Recent Progress in Brucella Infection Studies, by I. F. Huddleson (pp. 103–109); Induced Infectious Abortion in Cows on Different Rations, by F. B. Hadley (pp. 111–115); Experimental Infection with *Streptococcus epidemicus* of Monkeys and Cows, by W. D. Frost, F. B. Hadley, D. J. Davis, P. F. Clark, M. Gumm, E. G Hastings, and W. E. Welsh (pp. 181–184); Mastitis, by D. H. Udall (pp. 282–288); Bang Disease Control, by T. E. Munce (pp. 293–305); Buying Replacements Subject to the Agglutination Test, by J. G. Hardenbergh (pp. 306–312); Review of Abortion Control Work, by C. Way (pp. 312–314).

**A system of bacteriology in relation to medicine, I–IX** (*London: Med. Research Council, 1930, vol. 1, pp. 374, pls. 4, figs. 44; 1929, vols. 2, pp. 420, fig. 1; 3, pp. 413, figs. 13; 4, pp. 482, fig. 1; 1930, vol. 5, pp. 505. figs. 2; 1931, vol. 6, pp. 538, figs. 8; 1930, vol. 7, pp. 509, pls. 2, figs. 9; 1931, vols. 8, pp. 390, pls. 2, fig. 1; 9, pp. 364,* [*pls. 3*], *figs.* [*80*]).—These volumes, prepared by members of the Medical Research Council and collaborators, deal with the subject as follows: (1) History, morphology, and physiology; (2) cocci and hemophilic bacteria; (3) economic bacteriology, plague, anaerobes, and food poisoning; (4) enteric group, vibrios, and Pasteurella; (5) glanders, diphtheria, tuberculosis, leprosy, Brucella, and anthrax; (6) immunity; (7) virus diseases and bacteriophage; (8) fungi, Streptothriceae, spirochetes, normal flora, and swine erysipelas; and (9) technical methods and a general index.

**The biology of Bacterium pyoseptikem viscosum equi** [trans. title], GOURVITCH (*Ann. Inst. Pasteur, 46* (*1931*), *No. 1, pp. 64–72*).—The author finds this organization to be characterized by its pleomorphism, which is particularly evident in old cultures. Involution forms sometimes appear under unfavorable conditions, such as a high temperature. The formation of mucus is said to be characteristic of cultures of the organism. Its pathogenic properties are very weak, cultures gradually losing their pathogenic characteristics as they advance in age. Of the laboratory animals, the young dog is the most sensitive to new cultures when inoculated intracardially. The white mouse is also sensitive to the infection. The organism appears to produce toxins in vivo. Its resistance to physical and chemical agents is very weak.

**Tenacity of the dried virus of enzootic encephalomyelitis (Borna disease)** [trans. title], S. NICOLAU, I. A. GALLOWAY, and L. KOPCIOWSKA (*Compt.*

*Rend. Soc. Biol. [Paris], 107 (1931), No. 14, pp. 30–32).*—The authors find that when kept in a dry condition at a temperature of from 16 to 20° C. unprotected from the light, the virus of Borna disease remains viable for a period of at least 373 days.

**Revision of the genus Piroplasma** [trans. title], W. L. Yakimoff (*Arch. Protistenk., 74 (1931), No. 3, pp. 372–400, figs. 10*).—This revision is accompanied by a three-page list of references to the literature.

**Observations on normal synovial fluid of cattle.—I, The cellular constituents and nitrogen content,** W. Bauer, G. A. Bennett, A. Marble, and D. Claflin (*Jour. Expt. Med.. 52 (1930), No. 6, pp. 835–848, pls. 2*).—It is pointed out that "the astragalotibial (hock) joints of normal young beef cattle contain large and uniform quantities of synovial fluid which is easily accessible for study. Nucleated cells found in such synovial fluid are similar in numbers and types to those described previously in normal rabbits' synovia. The fact that 90 to 95 per cent of all nucleated cells present are actively phagocytic implies that the function of these cells is the removal of the products of wear and tear from the articular cartilages and synovial membranes. Red blood corpuscles seem to be present in numbers directly proportional to the trauma to which the synovial membrane is subjected

"The astragalotibial joints of young beef cattle contain from 3 to 5 times more fluid than do the corresponding joints of stable cattle. More débris and unidentified solid material is found in the latter group of animals. The total nitrogen content of this synovial fluid was found to be 169 mg. per 100 cc. The approximate total protein content was calculated to be 680 mg., or 0.68 per cent, per 100 cc. No correlation between the total protein level and the total cell counts of isolated specimens of synovial fluid is possible from these data.

"Further studies of synovial fluid and its chemical similarity to blood serum of the same animals are in progress. Articular cartilage defects occurring in the articular cartilages of the carpometacarpal joints are described."

**A systematic study of the degeneration of articular cartilage in bovine joints,** G. A. Bennett and W. Bauer (*Amer. Jour. Path., 7 (1931), No. 4, pp. 399–413, pls. 11*).—This contribution, in continuation of that above noted, was undertaken with the purpose of studying the degenerative changes in the articular cartilage from their beginning through all the stages of development, with a view to determining the causes for their occurrence. The finding of areas of degeneration in the articular cartilages of the carpometacarpal articulations of all cattle over two years of age is considered to be an adequate explanation of the synovial fluid differences observed. These areas of progressive degeneration in articular cartilage were studied systematically, and the successive changes are described and illustrated.

**Coccidiosis in calves,** A. Robertson (*Vet. Jour., 87 (1931). Nos. 673. pp. 312–325; 674, pp. 351–385, figs. 9*).—This is a detailed summary of information on coccidiosis as occurring in calves, presented in connection with a six-page list of references to the literature.

**A preliminary note on the treatment of chronic anaemic debility in sheep by inoculation,** N. Bissett (*Welsh Jour. Agr., 7 (1931), pp. 368–371, fig. 1*).—The administration of 5 cc. of antianthrax serum, as recommended by M. Dutems of France in 1928, is shown to be of considerable therapeutic value in combating chronic anemic debility in sheep.

**A report of forty tumors of sheep (Ovis aries Jordan),** W. H. Feldman (*Amer. Jour. Cancer, 15 (1931), No. 3, Sup., pp. 2044–2062, figs. 14*).—A report is given of a study made of 40 tumors obtained from 39 sheep which are classified histologically, and as far as possible the anatomic situation of the primary growth is recorded. It is concluded that the incidence of neoplasms in sheep is less than that for the other domesticated mammals, and that neoplastic disease does not constitute a factor of economic significance in the practice of sheep husbandry. A list of 25 references to the literature is included.

**A preliminary report on the poisonous effects of bitter rubber weed (Actinea odorata) on sheep,** A. B. CLAWSON (*Jour. Agr. Research [U. S.], 43 (1931), No. 8, pp. 693–701, figs. 2*).—The author gives a description of the plant and an account of its distribution, followed by a discussion of the plan of the experiments and the results of experimental feeding of the bitter rubber weed. These experiments have demonstrated that the plant is toxic to sheep, the principal symptoms produced being salivation, nausea, vomiting, depression, and weakness. It was found that if a sheep consumes 1.3 per cent or more of its own weight of the green plant within a short time, fatal results may follow. It was shown also that when a sheep eats as little as 0.1 per cent of its weight of the plant daily it may become ill in about 44 days, and that larger daily doses will produce effects in a correspondingly shorter time.

A report of studies of this plant and its poisoning of sheep by the Texas Station has been noted (E. S. R., 66. p. 273).

**Nodular worm infestation of domestic swine,** B. SCHWARTZ (*Vet. Med., 26 (1931), No. 10, pp. 411–415, figs. 2*).—It is pointed out that five species of nodular worms, namely, *Oesophagostomum dentatum, O. longicaudum, O. brevicaudum, O. georgianum,* and *O. maplestoni,* are known to be parasitic in the large intestine of domestic swine. The term last mentioned is proposed to replace *O. conicum,* a name unavailable for this parasite. The first four are known to occur in the United States. Hexylresorcinol in doses of not less than 4 gm. appears to be a promising treatment for the removal of nodular worms from swine.

**The treatment of equine surra by Naganol** [trans. title], H. JACOTOT (*Bul. Soc. Path. Exot., 24 (1931), No. 7, pp. 568–569*).—Naganol appears to be specific in the treatment of surra due to *Trypanosoma annamense.* When administered within the first few days after infection doses up to 1 gm. are sufficient, but with a delay in administration an increased dosage up to many grams becomes necessary in order to control the disease.

**Poultry diseases in Hawaii,** C. M. BICE (*Hawaii Univ., Agr. Studies No. 11 (1928), pp. 20, figs. 8*).—A brief practical account of the parasites and diseases of poultry in Hawaii.

**Baby chick disease control,** C. M. BICE (*Hawaii Univ., Agr. Studies No. 10 (1928), pp. 8, figs. 4*).—Control measures for white diarrhea, coccidiosis, and sore head (chicken pox) of baby chicks are dealt with.

**Notes on an outbreak of poultry epidemic,** F. GO KEE (*Philippine Agr., 17 (1928), No. 5, pp. 263–265*).—An account is given of an outbreak of disease on a farm near Manila in February, 1928, in which 2,700 fowls, mostly laying hens and young pullets, died within two months.

"There was loss of appetite, marked thirst, and dopiness. A thick tenacious mucus was discharged from the beak and nostrils. The nostrils were later plugged up with dried secretions. There was also marked conjunctivitis; the birds gasped for breath. There was a nervous twitching of the head. The comb and the rest of the head became purplish. The chickens assumed a sitting posture when signs of heavy breathing became more marked. The temperature was above normal, 41.4° C. (106.5° F.), both morning and afternoon during the first three or four days. If the chickens did not die, the temperature dropped to 40.0° on the sixth or seventh day. The crop became distended with gas, and there was marked diarrhea with white fecal discharge. In spite of the purging the sick bird maintained its weight. The disease attacked the adult birds that were at the height of their productive stage; the younger birds were less susceptible. The course of the disease was two weeks. The few chickens that recovered without treatment have one of the legs paralyzed. This paralysis is unilateral, never bilateral. Even if the bird recovered, apparently, there remains a slight habitual twitching of the head. . . .

"The disease is transmitted by the water in the common drinking troughs becoming contaminated by the mucous discharge of a sick bird."

**Experimental therapy in coccidiosis of the domestic fowl, C. Neff** (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 6, pp. 608, 609*).—The author finds that the lowering of fecal pH in hens naturally infested with Eimeria by means of an emulsion of lactic acid in agar, mineral oil, and water is more satisfactory in reducing or stopping oocyst discharge than the administration of various drugs, including carbon tetrachloride, tetrachlorethylene, methyl violet, acetarsone, and diphenylamine.

**The control of coccidiosis, H. J. Stafseth** (*U. S. Egg and Poultry Mag., 37 (1931), No. 9, pp. 46–48, 52, 64, fig. 1*).—A practical account, presented at the annual convention of the International Baby Chick Association in August, 1931.

**Infectious laryngotracheitis of fowls, W. R. Hinshaw** (*Vet. Med., 26 (1931), No. 8, pp. 324–327, fig. 1*).—This contribution from the California Experiment Station is a brief review of the present status of knowledge of the disease, presented in connection with a list of 16 references to the literature.

**Nature of the agent transmitting leucosis of the fowl, J. Furth** (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, pp. 449–451*).—The authors find the transmissible agent of filtrable tumors to be in large part attached to cells or to cell fragments. The filtrable tumors, unlike other filtrable virus diseases of the fowl, could not be transmitted to other species of birds. The properties as well as the character of the disease produced are considered to justify a separation of the filtrable agents of tumors within the apparently heterogeneous group of filtrable viruses, and suggest the possibility that the agent of filtrable tumors is not a virus in the ordinary sense.

**Acute neuro-lymphomatosis gallinarum in a strain of Rhode Island Red fowls, H. P. Bayon** (*Vet. Rec., 11 (1931), No. 36, pp. 907–911*).—This is a report of studies of an acute outbreak of neuro-lymphomatosis gallinarum observed in a small holding in 65 Rhode Island Red 6-month-old pullets. Eleven birds were affected, of which 7 died. One was killed for microscopical examination, 3 improved considerably after being fed with lettuce, but 1 relapsed after 5 days and recovered again later. These and 10 control fowls, 5 of which latter had definitely improved, were still under observation at the time of writing.

**Ranikhet disease: A new disease of fowls in India due to a filter-passing virus, H. Cooper** (*Indian Jour. Vet. Sci. and Anim. Husb., 1 (1931), No. 2, pp. 107–128, figs. 10*).—This account, which was presented at the World's Poultry Congress in 1930 (E. S. R., 64, p. 176), deals with the disease first described in the report of the Imperial Institute of Veterinary Research, Muktesar, India, noted on page 371.

"It is an acute, usually nonfebrile, contagious, and highly infective disease of fowls, caused by a filter-passing virus and characterized by respiratory distress and high mortality. Reports have frequently been received of heavy mortality occurring amongst the crow population of infected localities. The incubation period in the artificially produced disease is ordinarily from 3 to 5 days, but may be as short as 2 days or delayed until the sixth or seventh, and exceptionally even the fourteenth day. The duration of recognizable illness in the artificially produced disease is usually extremely short, averaging only 1.5 days, but the period may extend to 10 days. Ninety-five per cent of Indian country bred fowls used in transmission experiments proved to be susceptible to the virus, and only 10 per cent of the affected animals survived.

"Except for the occurrence of petechiae in the submucosa of the proventiculus, post-mortem lesions of diagnostic value are almost entirely absent. Emulsion of internal organs stored unpreserved in a refrigerator have been proved to retain their infectivity for periods extending to 169 days. Serum obtained from recovered fowls is protective against the disease, but serum produced from donkeys proved to have no protective value. A few attempts were made to prepare a vaccine suitable for employment against the disease, but they were unsuccessful. The disease had been shown to be immunologically identical by cross-immunity tests with both 'Newcastle disease' in England and 'avian pest' in the Philippine Islands."

**A study of the growth of S. pullorum on various culture media,** J. S. Glover (*Ontario Vet. Col. Rpt. 1930, pp. 73–76*).—Formulas are given of the 15 media studied, together with a comparison of growths of 3 pullorum strains and agglutination results of a mixture of the strains grown on the various media.

**Utilization of citric acid and of sodium citrate by Salmonella pullorum,** J. C. Weldin and A. R. Miller (*Rhode Island Sta. Bul. 232 (1931), pp. 16*).—In the study here reported, the details of which are given in tables, 84 strains of *S. pullorum* were tested as to their ability to utilize citric acid or sodium citrate by growing them in the citric acid medium of S. A. Koser and the citrate agar of J. S. Simmons. From 8 to 10 tests were run with each organism in each medium.

"In Koser's citric acid medium 13 strains grew consistently, 10 failed to grow at all, and the remainder were variable in their reaction. In Simmons' citrate agar 21 grew in every test, 20 never grew, and the remaining 43 were variable. It was found difficult to determine in many instances whether growth had actually occurred or not in Koser's citric acid medium. The turbidity was so slight in many instances that results could only be recorded as questionable growth. On the other hand, growth in Simmons' citrate agar was slow but the reaction was definite if incubation was continued long enough. The majority of the strains of *S. pullorum* were shown to be able to utilize citric acid or sodium citrate as a sole source of carbon, although a few strains were found which were unable to attack these compounds. Neither medium is recommended for dividing this species into subgroups nor in the identification of *S. pullorum*."

**Use of organic acids for the differentiation of Salmonella pullorum and Salmonella gallinarum,** W. L. Mallmann (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 5, pp. 501, 502*).—In the author's studies at the Michigan Experiment Station, "both sodium salts of *d*-tartaric and mucic acids differentiated between *S. pullorum* and *S. gallinarum*. Using these salts on a number of strains of both organisms over a period of three years, no variations or exceptions in the reactions listed above were obtained with either the tartrate or mucate media. Liquid and agar stab cultures gave the same reactions. The data on *S. aertrycke* and *S. schottmülleri* confirmed the work of [E. O.] Jordan and [P. H.] Harmon.[1] The identical reactions obtained with *S. gallinarum* and *Shig[ella] jeffersonii* add strength to the statement of St. John-Brooks and Rhodes [E. S. R., 50, p. 185] that these two organisms are identical."

**The existence of fowl typhoid in India,** H. Cooper and R. N. Naik (*Indian Jour. Vet. Sci. and Anim. Husb., 1 (1931), No. 2, pp. 99–106*).—The authors report upon an outbreak of disease among poultry due to *Salmonella gallinarum* which first came to attention in August, 1930. This is believed to be the first time that fowl typhoid has been recorded from India.

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[1] Jour. Infect. Diseases, 42 (1928), No. 3, pp. 238–241.

**Spontaneous and experimental infection of pigeons with B. aertrycke,** J. R. Cash and C. A. Doan (*Amer. Jour. Path., 7 (1931), No. 4, pp. 373–398, pls. 8*).—A detailed account of the work previously noted (E. S. R., 65, p. 574).

**Treatment of experimental trichinosis in rabbits with neutroflavine,** C. Africa and J. T. Lucker (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, pp. 432–434*).—In the studies conducted, injections of neutroflavine into rabbits experimentally infected with *Trichinella spiralis* produced what appeared to be a marked diminution in the number of larvae or their total destruction. It is considered probable that the larvae were destroyed in the circulation by the drug. since the best results were obtained with 10 to 12 consecutive daily intravenous injections at a stage of the disease when the larvae were most abundant in the circulation.

## AGRICULTURAL ENGINEERING

**List of institutes and research stations dealing with agricultural engineering,** A. Brizi (*Liste d'Établissements d'Enseignement et de Recherches s'occupant de Génie Rural. Rome: Inst. Internat. Agr., 1930, 2. ed., pp. 121*).—This address list of the institutes and research stations dealing with agricultural engineering throughout the civilized world and of other institutions giving special instruction in the subject also contains information as to their scope. work. and personnel. Some of the data are given in 5 languages.

**[Agricultural engineering investigations at the Missouri Station]** (*Missouri Sta. Bul. 300 (1931), pp. 36–46, 97, figs. 7*).—Data are reported by J. C. Wooley on the relation between the investment in service buildings and the earning value of farm land. based on a survey of the farms in Nodaway County. These indicate the investment in farm buildings and its contribution toward the farm income, and show that the annual cost of service buildings on these farms is 5.79 per cent of the cost of production.

Studies of electric refrigeration for farm dairies by R. R. Parks and M. M. Jones made on 16 farm dairy refrigeration plants showed that the first cost of the refrigeration plants varied from $555 to $1,750 per 100 gal. daily capacity. The wet storage type of system was cheaper than the dry type. The larger systems were cheaper per 100 gal. capacity than small ones. Homemade cold storage rooms were generally cheaper than those bought ready made. The type and quantity of insulating material used in the walls also affected the cost. The addition of accessories increased the first cost in some cases.

Operating cost ranged from 0.09 to 0.48 kw. hour per gallon of milk cooled. Energy consumption was affected by the temperatures to which the milk was cooled and stored and the quality of insulation on the storage room or tank. Under average conditions, an energy consumption of 0.10 to 0.15 kw. hour per gallon of milk cooled and stored was considered good.

Air-cooled compressors and condenser coils were usually to be recommended rather than water-cooled machines. Where only wholesale milk was produced and the milk sold in cans. a wet type tank met the requirements for both the precooling and the storage. Usually there was a lower bacteria count in milk where it was cooled in cans in a wet storage tank rather than precooled over an aerator and then stored. Dry storage was generally preferred for the retail dairy where the milk was sold in bottles.

Data also are reported on filling silos with a 5-h. p. motor, underheating for electric brooders, and heating hotbeds with electricity. It was found that electrically heated hotbeds were practical and economical where electrical energy was available at from 2 to 3 cts. per kilowatt-hour or less and where manure was relatively expensive. The heat and rate of growth can be better controlled in electric hotbeds than with manured beds.

M. F. Miller and H. H. Krusekopf reported that in the soil erosion experiments at the end of 12 years the losses from land in continuous corn have been almost 7 times as great as the losses from land on which a good crop rotation has been followed and almost 50 times as great as that from bluegrass sod. Land plowed 8 in. deep has eroded somewhat less than that plowed 4 in. deep.

Four years' data indicate that on the plats in continuous corn the loss per unit area has been less with increasing length of slope. The loss from a slope of 8.48 per cent has been 0.92 surface in. annually, as compared with 0.50 surface in. from a 6 per cent slope and 0.13 surface in. from a 3.68 per cent slope.

**Irrigation in western Oregon,** M. R. Lewis and A. King (*Agr. Engin., 12 (1931), No. 7, pp. 279–282, figs. 2*).—In a contribution from the Oregon Experiment Station and the U. S. D. A. Bureau of Public Roads, data are presented on irrigation practice and needs in western Oregon.

**Flood flows,** A. Hazen (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. VIII+199, figs. 56*).—This book presents the results of a study of frequencies and magnitudes of flood flows, and it contains chapters on definitions of flood quantities: method of plotting annual floods; data available for study; the coefficient of flood; the coefficient of variation; the coefficient of skew; drawing a smooth curve; tables and plottings; effect of one large flood; the three coefficients and the flood ratio factors; duration curve as a method; the extreme flood method; seasonal distribution of flood flows, and local and other factors; effects of great storms; effects of storage, forests, and land drainage; obstructions, débris, and sediment; changes in climate; and methods of flood protection.

**A reverse slope draining system,** A. G. D. Bagot (*Tea Quart. [Tea Research Inst. Ceylon], 3 (1930), No. 3, pp. 73–76, pl. 1*).—This system of hillside drainage and erosion control is described and illustrated.

**Supporting strength of concrete-incased clay pipe,** W. J. Schlick (*Iowa Engin. Expt. Sta. Bul. 93 (1929), pp. 64, figs. 24*).—The results of tests with commercial vitrified salt-glazed clay pipe are reported. These showed that the safe supporting strength of a concrete-incased clay pipe is only slightly greater than the sum of the individual supporting strengths of the clay pipe and the incasement. The supporting strength of an incased pipe increases as its temperature is lowered and vice versa, and the rate of change is very rapid for temperatures between 30 and 0° F. The increase in supporting strength is due primarily to the effect of temperature on the strength of concrete and, to a lesser extent, to the greater bond strength which is developed. The action of an incased pipe is very nearly that of two independent but concentric rings.

The average values of the moduli of elasticity for each material in both tension and compression are nearly the same. In general. the modulus of rupture of either material may be taken as from two to two and one-half times the ultimate tensile strength and about one-sixth of the ultimate compressive strength.

**Report of proceedings of the Second Southwest Soil and Water Conservation Conference** (*Oklahoma Sta. Circ. 79 (1931), pp. 94*).—The text of the proceedings of this conference, held June 19 and 20, 1930, is presented. These include among other things special papers on Research Program of Soil Erosion in Oklahoma. by C. P. Blackwell (pp. 8, 9); The Oklahoma Soil Erosion Survey, by N. E. Winters (pp. 9, 10); The Soil Conservation Research

Program for the Southwest. by A. G. McCall (pp. 11–15); Experimental work on Soil Erosion and Water Control in Texas, by R. E. Dickson (pp. 16, 17); Experimental Work in Kansas, by F. L. Duley (pp. 19–21); Soil Erosion in Western Mississippi, by G. H. Lentz (pp. 23–31); There Can Be too Little Erosion, by M. F. Miller (pp. 32–35); Study of Runoff from Terraced Fields, by R. W. Baird (pp. 36–38); Soil Erosion Work of the Bureau of Chemistry and Soils at Guthrie, Oklahoma, by S. W. Phillips (pp. 40–45): Results of Experiments on Erosion Control on the Guthrie Soil Erosion Experimental Farm, by C. E. Ramser (pp. 46–53); Handling Runoff from Terraced Fields, by L. E. Hazen (pp. 55–57); Report on Protecting Road and Hillside Ditches with Concrete Baffles, by W. H. McPheeters (pp. 57–61); and Soil Erosion, by H. H. Bennett (pp. 62–69).

**The dynamic properties of soil, I, II,** M. L. Nichols (*Agr. Engin., 12 (1931), Nos. 7, pp. 259–264, figs. 6; 8, pp. 321–324, figs. 2*).—This contribution from the Alabama Experiment Station is divided into two parts.

I. *An explanation of the dynamic properties of soils by means of colloidal films.*—This is an explanation of the dynamic properties of soils by means of colloidal films, and summarizes the results of several years' research in the subject. It has been found that the reactive forces of all classes of soil are due to or are dominated by the film moisture on the colloidal particles. The colloidal content can thus be used as a means of calculating the place and amount of reactions of nonplastic soils.

The film force is indicated by the formula $F = \frac{K 4 \pi R T \operatorname{Cos} \alpha}{D}$ where $F$ is force, $K$ a constant, $R$ the radius of particles, $T$ the surface tension, $D$ percentage of moisture, and $\alpha$ the angle of moisture contact to the surface of the particle. The variation in place and amount of maximum reaction with nonplastic soils is shown to be proportional to colloidal content and is probably due to the action of film moisture on the colloidal particles.

The place and amount of the reactions of plastic soils are shown to be indicated by the Atterberg plasticity constants. The variation in place on the moisture range of these constants is due to the chemically combined and physically absorbed water which does not enter into film action. With the chemical and physical absorption accounted for, the plasticity number, which indicates the amount of soil reaction, is shown to be a function of the colloidal content. These facts indicate that variation in the reactions of all soils is due to the film moisture on the colloidal particles.

II. *Soil and metal friction.*—Studies are reported on soil and metal friction as the basic factor in the development of tillage tools. It has been found that friction between a soil and metal surface may be classified by division into four distinct and separate phases. These phases depend upon the bearing power of the soil, its moisture content, and the pressure of the metal surface. The colloidal content is the controlling soil factor. Approximate formulas for determining the frictional values and moisture contents at which the different phases occur in nonplastic soils are derived from friction data. In plastic soils the absorptive and chemical action of the colloidal content becomes more important, and the Atterberg consistency constants are used as indexes of frictional values. Formulas for determining frictional values for these soils are presented.

Soil friction values for a series of steels of known composition and heat treatment and chilled plow iron are also given. The friction of a metal was found to be determined largely by its hardness and polish. For the soils studied $\mu' = 0.24 + 0.005C - 0.0001H$, where $\mu'$ is the coefficient of kinetic friction, $C$ the colloidal content, and $H$ the hardness as determined from the

Brinell number. When the colloidal content exceeds 32 per cent, the friction increases but slightly for added increments of colloid and this is taken as the approximate limit of that factor.

Polish is shown to affect frictional values materially in the heavier soils, but as no measure of polish was available no mathematical formula for its effect was attempted. A polish higher than that commonly found on commercial plows was found to be of no practical value on sandy soil. It was found that the adhesion of soil to plow surfaces varied with the polish and composition of the metal. Steels containing chromium or nickel were the most satisfactory of those tried. Experiments with various surface and heat treatments indicated that the surface attraction for soil moisture may be altered, but no practical method of doing this was found.

**Cleavage tests of timber,** E. G. Coker and G. P. Coleman (*Roy. Soc. [London], Proc., Ser. A, 128 (1930), No. A808, pp. 418–431, figs. 10: abs. in Sci. Abs., Sect. A—Phys., 34 (1931), No. 398, p. 84*).—Cleavage is critically studied and discussed by reference to photoelastic tests carried out with isotropic material, particular attention being paid to the effect of the geometry of the specimen upon the results. It was found that fairly comparable results in cleavage tests can be expected only when one form is adhered to, and a numerical value of cleavage property, calculated from the load at fracture, and the assumption of stress conditions derived from isotropic models can at best afford only an approximate value of this property. It is thought better to rely on a simple tension test to define cleavage property, the load being applied uniformly and normally to the grain of the timber.

**Handbook of farm machinery technic, I,** G. Kühne (*Handbuch der Landmaschinentechnik. Berlin: Julius Springer, 1930, vol. 1, pp. VIII+353, figs. 888*).—This handbook, which is an outgrowth of studies conducted at the Technical Academy at Munich, deals with the technical and technological developments of tillage, seeding, and fertilizer machinery. It contains chapters on implements for soil tillage with horse and tractor power, motor plows, tractors, and tractor machinery; soil pulverizers; fertilizer and seeding machinery; and planting machinery.

**Annual report to the Texas Committee on the Relation of Electricity to Agriculture, 1930,** P. T. Montfort (*College Station: Tex. Com. Relat. Elect. Agr., 1930, pp. 146, figs. 35*).—This report states that on October 31, 1930, the total number of farms receiving central station electric service in Texas was 8,046, an increase of 14.6 per cent for the previous 6-months period.

Brief descriptions also are given of 34 electro-test farms and of 5 miscellaneous investigations under way at the Texas Experiment Station, including a rural line study and studies of poultry equipment, feed grinding, electric hotbeds, and silo filling. An extensive summary of the progress results is included.

**Electrical equipment on movable bridges,** C. B. McCullough, A. L. Gemeny, and W. R. Wickerham (*U. S. Dept. Agr., Tech. Bul. 265 (1931), pp. 114, figs. 70*).—This is a condensed presentation of those fundamental principles of movable bridge electrification which must be applied in making a selection of an assembly of electrical apparatus for bridges. It contains main sections on electric motors, control and interlocking of operations, wiring for electric control, and recent developments in electrical bridge control.

An appendix contains extracts from the Industrial Control Standards of the National Electrical Manufacturers' Association relating to definitions, kinds of protection, relays, qualifying terms of relays, properties and characteristics of apparatus, rating, performance, and test, and manufacturers' specifications.

**The development of a corn combine,** C. A. Logan (*Agr. Engin., 12 (1931), No. 7, pp. 277, 278, figs. 2*).—In a contribution from the Kansas Experiment Station, the results of experiments are presented. These indicate that, mechanically, the corn combine is past the experimental stage but appears to be a little too far advanced for present methods of corn storage. since most corn is not ready to store as shelled corn at harvest time. It has been found that the combination corn and wheat machine provides a dual-purpose combine which can be used more days throughout the year. The stalks, after passing through the machine, are placed back on the field in such a manner that the field is left in good condition.

**Present status of mechanical corn picking,** A. L. Young (*Agr. Engin., 12 (1931), No. 7, pp. 267–270, fig. 1*).—In this summary from the Illinois Experiment Station, it is pointed out that mechanical corn pickers are rapidly changing and are far from standardized, although the essential mechanism of the later models is much the same as that of the earlier machines. Changes are still being made in the shape, size, position, and arrangement of gatherers, snapping rolls, and husking rolls. Gears, sprockets, and chains are being made of better materials, and gatherer chains and snapping rolls are being carried closer to the ground to permit better picking up of lodged corn. The top sheets of gatherers have been widened and made more rounded, and sharp edges and corners are being eliminated. Safety slip clutches at various places protect against breakage.

It is concluded, that although the mechanical husking of corn is definitely on the upgrade. the machinery provided does not perform as satisfactorily as does most of the machinery used in growing the crop. In spite of all the improvements, excessive amounts of corn are wasted.

**Comparative effectiveness of hand and mechanical corn picking,** W. H. Carter (*Agr. Engin., 12 (1931), No. 7, pp. 276, 277, figs. 3*).—In a brief contribution from the Iowa Experiment Station, the results of a comparison of hand and mechanical corn picking are presented graphically. They indicate the need for further development of the mechanical picker-husker to increase its effectiveness. It is pointed out that, if a mechanical picker-husker is to be employed, it should be used as soon as the corn is dry enough to crib.

**Some observations on hammer type feed grinders,** W. Vutz (*Agr. Engin., 12 (1931), No. 7. pp. 271–274, figs. 3*).—The results of tests, dealing mostly with capacities, of the performance of large hammer type feed grinders are presented. No conclusions are drawn.

**Power requirements of spray agitation,** K. R. Frost (*Agr. Engin., 12 (1931), No. 7, pp. 265, 266, figs. 5*).—Studies conducted at the California Experiment Station are briefly reported.

The results show that the power requirement for agitation of sprays increases with the speed, and is approximately proportional to the cube of the speed for speeds in excess of 200 r. p. m. The power consumption is greatest for any given speed when the agitating blades are set in a common plane. Other things being equal, the power requirement is greatest when the blades are completely submerged and the power decreases as the water level in the tank decreases.

**The design of grain storage structures,** J. D. Long (*Agr. Engin., 12 (1931), No. 7, pp. 274, 275, figs. 2*).—In a contribution from the California Experiment Station, data are presented on the design of grain storages. These data are concerned primarily with structural safety as regards the use of sheet metal and concrete staves.

**Guide for the construction and operation of steam silos for the ensiling of potatoes,** E. Berendt (*Leitfaden für den Bau und Einrichtung von Heiss-*

*dampf-Gruben-Silos für Einsäuerung von Futterkartoffeln. Hanover: M. & H. Schaper, 1931, pp. [3]+66, figs. 18*).—This pamphlet describes a new method of potato steaming and ensiling and presents and illustrates the details of the process.

**New developments in dairy refrigeration,** L. C. PRICKETT (*Agr. Engin., 12 (1931), No. 8, pp. 317–320, figs. 3*).—This abstract of a comprehensive paper on the subject of dairy refrigeration, which is to be published later in complete form by the Committee on the Relation of Electricity to Agriculture, summarizes the more recent developments and includes a bibliography of 15 references to reports of research on the subject.

**Treatment and disposal of dairy waste waters,** F. H. McDOWALL (*New Zeal. Dept. Sci. and Indus. Research Bul. 27 (1931), pp. 36, figs. 3*).—Technical information is given, for the use of engineers, on the treatment and disposal of dairy waste waters. A list of 18 references to the reports of studies bearing on the subject is included.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**[Investigations in agricultural economics at the Missouri Station, 1929–30]** (*Missouri Sta. Bul. 300 (1931), pp. 29–35, figs. 4*).—A study by O. R. Johnson and B. H. Frame showed that, with the exception of the war period and immediately following, the cost of horse work from 1912 to 1929, inclusive, varied between 8 and 11 cts. per hour. The chief factors affecting the cost per hour were cost of feed and number of hours of work.

A study by F. L. Thomsen and P. Richards of the short-time fluctuations in hog prices showed no regularity in the directional movement of daily fluctuations significant to shippers. A chart is included showing the fluctuations through a year. On the average, no one day of the week was better than another so far as prices were concerned. A high correlation was found between the daily prices at St. Louis and other markets.

Charts by Thomsen are included showing the percentage distribution of staple lengths and grades of cotton in Missouri and in the United States for the crop year 1929–30.

In a study by Johnson, J. C. Wooley, and Frame, comparisons are made of the averages for 87 farms in Nodaway and Atchison Counties and for the 20 most profitable and the 20 least profitable of these farms, of the labor income, investments, interest earned on net capital, cost of maintenance, wages per worker and per hour of productive labor, size of farms, days of productive labor per year, acreages of different crops, numbers of different kinds of livestock, productivity of farms, yields of crops, returns per $1 worth of feed fed, value of feed used per $100 worth of livestock, days of productive labor per worker, number of units of livestock cared for per worker, machinery investment per worker, investment per acre in land, improvements, fencing, machinery, and feeds, supplies, and livestock, and other efficiency and business factors.

A map is included, prepared by C. H. Hammar and W. J. Roth in cooperation with the U. S. D. A. Bureau of Agricultural Economics, showing the types of farming areas in Missouri.

**Bibliography of research work in economics in Canadian universities** (*Univ. Toronto Studies, Hist. and Econ. Ser., Contrib. Canad. Econ., 2 (1929), pp. 69–97*).—This is a partial list of theses written under the direction of the economic departments of the various universities in Canada.

**Semi-annual index of farm real estate values in Ohio, January 1 to June 30, 1931,** H. R. MOORE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 41*

(*1931*) *pp.* [*1*]+*10. figs. 2*).—This report continues the series previously noted (E. S. R., 65, p. 389).

**A mathematical approach to forest taxation, D. Pingree** (*Jour. Forestry, 29* (*1931*), *No. 5, pp. 750–762, fig. 1*).—The author develops formulas for determining tax ratios under several conditions, and with them compares deferred-yield and sustained-yield forests and shows the influence upon the financial set-up of changes in interest and tax rates, the introduction of a yield tax and a separate bare-land tax, and other factors.

**Taxation of timber properties in Oregon and Washington, R. C. Hall** (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 14* (*1931*), *pp.* [*4*]+*11*+[*24*]).—This study is based chiefly upon 70 answers to form statements sent in 1928 to owners of blocks of timber being held in reserve or for investment and to active operators, and upon reports of the State tax commissions of Oregon and Washington in 1926. Tables are included and discussed showing, by counties, the assessment and taxation of timber and cut-over lands, assesment ratios, the trends in assessments and taxation, the relation of taxation to carrying charges, and the relation of taxation to investments, gross profits, net income, etc.

**Labour requirements in farming, J. E. Lattimer** (*Univ. Toronto Studies, Hist. and Econ. Ser., Contrib. Canad. Econ., 2* (*1929*), *pp. 14–33, figs. 2*).—The labor requirements in farming in Canada and the factors which influence them are discussed.

**Agricultural regions of North America.—Part IX, The North Pacific hay and pasture region, O. E. Baker** (*Econ. Geogr., 7* (*1931*), *No. 2, pp. 109–153, figs. 22*).—This is the ninth article in the series previously noted (E. S. R., 63, p. 782).

**The farm business in Saskatchewan.—Study No. 4, W. Allen** (*Saskatchewan Univ., Col. Agr. Ext. Bul. 52* (*1931*), *pp. 134, figs. 26*).—This is a continuation of the series previously noted (E. S. R., 65, p. 680) and covers the Swift Current-Gull Lake region, an area of quite varied topography and with soils ranging from heavy clays to fine sands.

**The farmer's business: Comparative conditions in part of South Oxfordshire in 1923 and 1929, R. N. Dixey, W. H. Jones, and P. M. Reason** (*Oxford: Univ. Oxford, Agr. Econ. Research Inst., 1931, pp. 27, figs. 2*).—This report outlines the adjustments made between 1923 and 1929 in an area in South Oxfordshire, England. It is based upon surveys made in 1924 and 1930 and shows an increase of 20 per cent in the number of milch cows, a 16 per cent decrease in the area sown to wheat and barley, less fattening of cattle, an increase in the sale of store cattle and veal calves, a decline in the sale of fat tegs, a greater production of fat lambs and store sheep, an increase in the production of porkers, a 60 per cent decline in the number of heavy baconers sold, an increase of from 29s. 7d. to 33s. 5d. per week in average wages, a de crease of 3s. per acre in the total outlay for labor, a decrease of 16.4 per cent in the number of laborers including family labor, and a decrease from 82 to 75 per cent in the proportion of labor performed by wage-paid labor.

**Report on the sugar beet industry at home and abroad, A. Wood, J. H. Gorvin, and B. A. Forster** ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 27* (*1931*), *pp. XIV+293, illus. 69*).—This report was prepared with a view to reviewing the progress in the British sugar beet industry under the subsidy granted by the British Sugar (Subsidy) Act, 1925. It gives a brief historical survey of the industry in different countries, and covers the agricultural and manufacturing phases of the industry, sugar taxation and State assistance, marketing sugar, and beet and sugar prices. The progress of and prospects for the industry in Great Britain are discussed.

**A review of the maize situation in the Union of South Africa,** W. J. Lamont (*Union So. Africa Dept. Agr. Bul. 101 (1931), pp. 25*).—The maize situation in the Union, the production in other countries, and the results of voluntary cooperative marketing in the Union are discussed. A survey is made of schemes in other countries to improve maize prices, and the probable effects of such schemes in the Union are discussed.

**Market milk situation in Youngstown, Ashtabula, Warren, and Steubenville, Ohio, in 1930,** C. G. McBride (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 39 (1931), pp. [1]+22, figs. 6*).—The data in this survey were obtained mainly from the boards of health and milk distributors of the four markets, the Dairymen's Cooperative Sales Company, the U. S. Bureau of the Census, and the Ohio State veterinarian. The supplies of each city and their relation to the operations of the sales company are analyzed. The regulations of the boards of health and the methods of paying producers and their effects upon the seasonal variation of farm sales are discussed.

The sales company's method of buying milk, a combination of pool and base surplus plans, was found to have the following effects: (1) The average daily sales in August were relatively lower for the base surplus producers than for the nonbase producers; (2) following August the sales of the base producers turned upward sharply, while those of nonbase producers tended to decline until October or November; and (3) the base surplus plan induced a secondary swell of production during September to December, inclusive.

**Dairy products,** E. C. Voorhies (*California Sta. Bul. 514 (1931), pp. 188, figs. 38*).—This bulletin analyzes the chief data relative to the dairy industry in the United States and California, and revises such data appearing in the publication previously noted (E. S. R., 58, p. 383). The development and importance of the industry; the distribution of dairy cows and purebred dairy cattle; the trends in number of such cattle and heifers; dairy feed conditions in California; productivity per cow; utilization of milk; the production, consumption, prices and purchasing power, and the storage and holdings of dairy products; the cost factors in milk production; the domestic, foreign, and international trade in dairy products; oleomargarine; disease in dairy cattle; freight and express rates on dairy products; and the world, United States, and California situation in the industry are discussed.

The conclusions are reached that the present and immediate future is not a time to advocate the increase in the number of dairy cows in California; that if the population of the State continues to increase, a steady, conservative growth in dairying can be contemplated; and that the production of large amounts of milk fat for other than market milk must be on the basis of cows of higher producing ability.

**Cold storage of southern eggs,** G. R. Sipe (*Poultry Sci., 10 (1931), No. 5, pp. 224–235*).—This is a detailed report of a test, made by the Mississippi Experiment Station, of 26 cases of eggs stored from May 17 to November 5, 1930, in a temperature of 29 to 31° F. Two cases were western eggs and 24 Mississippi eggs, of which 19 were produced with a balanced ration containing 5 per cent or less of cottonseed meal, 1 with a ration containing 20 per cent of cottonseed meal, 3 from farm flocks with a corn, grass, bugs, and table scraps ration, and 1 purchased from a country store. All, except the 1 country store case, were less than 5 days old when shipped and not over 1 week old when placed in storage.

The Mississippi eggs produced on a satisfactory ration showed an average grade loss of 0.066 during the storage period. Farm run eggs purchased direct from the farmer had a fairly high storage efficiency. The store eggs had a low storage efficiency. Very little difference was found in the keeping quality of the properly produced Mississippi eggs and western eggs. The occurrence of green or olive yolked eggs did not prove serious except where a ration high in cottonseed meal was used.

**New Mexico egg storage studies, Part II,** A. L. Walker, L. N. Berry, and E. E. Anderson (*New Mexico Sta. Bul. 195 (1931), pp. 25, figs. 4*).—Continuing this study (E. S. R., 62, p. 257), this phase was undertaken to determine whether it is profitable and advisable to candle average-run eggs as they normally come to market. and (1) store the better grades for an increased price, (2) store during the usual egg storage months, and (3) ship eggs from different surplus areas to El Paso, Tex., for storage. A total of 100,437 eggs from four produce dealers in different surplus-producing areas were candled and graded before and after storage.

Eggs stored in April returned a larger profit per case than those stored in March, May. or June. The difference was due to the lower cost per case, to the fact that they sold at a higher price, and more of these eggs were sold with the guarantee of quality than eggs stored in the other months. Brown-shelled eggs apparently kept better than those with white shells, but this difference was believed to be due to the fact that the density and dark color of the shell made it difficult to determine the interior quality of the dark-shelled eggs.

Of the total cost of stored eggs, the eggs themselves constituted the greatest cost, with charges for storage and transportation from point of origin to El Paso next. Miscellaneous costs included such items as flats, drayage, and cost of constructing cases. A reduction in costs could have been made by shipping in carload lots, thus saving in transportation and in storage cost by obtaining a lower rate for the larger number of cases.

The results showed that under conditions similar to those in this test eastern New Mexico eggs when properly handled, candled, and graded can be stored with a profit during the months of March. April, and May, with the April-stored eggs offering the greatest opportunity for profitable storage operations.

**Marketing Iowa's poultry products,** W. D. Termohlen and G. S. Shepherd (*Iowa Agr. Col. Ext. Bul. 173 (1931), pp. 16, figs. 10*).—Tables and maps are included and discussed showing the number, classification, and geographical distribution of local dealers and car-lot packers and shippers of eggs and poultry.

**Farm produce received in trucks on the Columbus wholesale market, 1930,** C. W. Hauck (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 40 (1931), pp. [1]+22, figs. 7*).—This is a continuation of the series previously noted (E. S. R., 63, p. 785).

**Note on the work and finance of the Empire Marketing Board** (*London: [Gt. Brit.] Empire Marketing Bd., 1931, pp. 34*).—The work and finances of the board established in May, 1926, for "furthering the marketing in this country [Great Britain] of Empire products" are described. and a table is included showing the grants for research and other schemes approved by the Secretary of State for Dominion Affairs from July, 1926, to March 31, 1931.

**Farmers' cooperative corporations in Pennsylvania,** H. A. Hanemann (*Penn. Dept. Agr. Bul. 505 (1931), pp. 56*).—Synopses of the cooperative agricultural acts of the State and information as to how to incorporate and finance agricultural cooperative associations are given. The membership rights and obligations, the special privileges of such associations, and the taxes for which they are liable are discussed. Appendixes give suggested forms of articles of association, by-laws, and agency and sale contracts for marketing.

**[Investigations in rural sociology at the Missouri Station, 1929–30]** (*Missouri Sta. Bul. 300 (1931), pp. 94–96*).—A study in 42 counties by W. Burr and G. Gemmell of rural community organization in public welfare showed that 50 per cent of the cases of relief outside of institutions were rural and of these 30 per cent lived on farms. Eighty and nine-tenths per cent of all poor relief was given in cash. Of 971 cases, 171 received $60 per year, while 5.5 per cent received $120, indicating a lack of case studies and administration for rehabilitation.

A quantitative study in population in 391 incorporated places of Missouri, made by H. E. Jensen, showed the following indexes: 1890 (base), 100; 1900, 116; 1910, 123; and 1920, 127, as compared with 100, 121, 146, and 168, respectively, for the United States.

**Are rural services obsolescent?** V. A. Rapport (*Amer. Jour. Sociol.*, *37* (*1931*), *No. 2, pp. 266–272*).—The study is based on material obtained in a survey made by the Connecticut Storrs Experiment Station of the folkways and mobility of the rural population in six Connecticut towns. Tables are included showing for each of the towns the percentage of families—farmers, part-time farmers, and nonfarmers, both commuters and noncommuters, and retired—having automobiles and trucks; the number of families leaving the towns for different number of services; percentage of families leaving the towns for various services; and the services in the towns. The services obtained outside the towns are ranked by several methods.

The analysis shows that the importance of the rural town in providing services is decreasing, and that rural residents are drawing more and more heavily on the facilities of available urban districts.

**Qualitative selection in cityward migration,** W. Gee and D. Runk (*Amer. Jour. Sociol.*, *37* (*1931*), *No. 2, pp. 254–265*).—The data for this study were obtained from families in Albemarle County, Va., classified on the basis of economic conditions and cultural backgrounds as follows: Upper group, 30 families with 104 possible migrants (children 15 years of age or older who had graduated from public school or college or who had left school without completing an entire formal course); middle group, 60 families with 237 possible migrants; and lower group, 30 families with 132 possible migrants.

Tables are included and discussed showing for each group the sex distribution of the possible migrants, nonmigrants, and migrants; the destination (country or urban centers) and sex distribution of migrants to the two destinations; the education of migrants to the country, towns, and cities; and the occupational classes entered by the migrants of each sex from each group. The attitude of the operators toward the work of their sons is discussed.

The study does not indicate a chance selection in the cityward migration and does not support the position that the cities attract the extremes in the population and the country the mean. The percentages of the migrants going to urban centers were 81.36 for the upper, 75.78 for the middle, and 54.95 for the lower groups, supporting the conclusion that the cities tend to attract from the rural areas in largest proportions the best of the population. The educational levels of the different groups indicated a considerable measure of correlation between the grade of educational equipment and the class level in the social order, and the same variations were strongly reflected in the occupational levels of the migrants. The attitudes of parents in the three groups toward their sons' farming paralleled to a considerable measure the preponderant migration in the groups.

**Building permanent farm-forest communities,** L. C. Gray (*Manfrs. Rec.*, *100* (*1931*), *No. 10, pp. 28–30, figs. 3*).—This article is based on a study of conditions in the Appalachian region of West Virginia made by the U. S. Department of Agriculture and the West Virginia Experiment Station.

## FOODS—HUMAN NUTRITION

**Aunt Sammy's radio recipes, revised,** R. Van Deman and F. W. Yeatman (*U. S. Dept. Agr., Bur. Home Econ., 1931, rev. ed., pp. V+142*).—This is the fourth enlarged edition of the collection of recipes and menus originated by the Bureau of Home Economics for the radio service housekeepers' chats. It contains 400 of the most popular recipes and 90 menus, including 10 breakfast and 10 lunch or supper menus and groups of appropriate dinner menus for each month in the year.

**Foods and drugs,** J. M. Bartlett (*Maine Sta. Off. Insp. 139 (1931), pp. 16*).—This is the annual tabulation of the results of the examination of food and drug samples collected by the division of inspections of the State department of agriculture (E. S. R., 63, p. 602).

**The validity of family coefficients,** E. P. Cathcart and A. M. T. Murray (*Jour. Nutrition, 3 (1931), No. 5, pp. 483–489*).—This discussion is based upon data, reported in the appendix of a monograph noted previously (E. S. R., 65, p. 290), on the relative distribution of food among the various members of five of the families studied as compared with the standards adopted. As previously noted, the average consumption of the men in these families was about 12 per cent higher in calories than the standard. This represented not a flat increase in every unit, but an increase of about 19 per cent in protein and 25 per cent in fat. The average intake of the women was more than 21 per cent below the standard man value instead of the conventional 17 per cent and over 29 per cent below the actual man value. The increase in the protein consumption of the men was matched by a decrease in that of the women, who obtained approximately 24 per cent less of protein and fat, respectively, and 19 per cent less of carbohydrate than the men.

These results and others quoted from the literature lead the authors to conclude that "the indiscriminate and uncritical use of family coefficients is fraught with danger. We do not suggest that the method of family coefficients is useless and should be discarded. Such a suggestion would be far from the truth, but we do claim that it is a problem which requires immediate investigation despite its difficulty and laboriousness. The data must be collected from families living under normal conditions of life and labor. Institutional data, no matter how accurately collected, can never fulfill the same end."

**The respiratory metabolism in infancy and in childhood.—XII, A biometric study of basal metabolism in normal infants,** S. Z. Levine and E. Marples (*Amer. Jour. Diseases Children, 41 (1931), No. 6, pp. 1332–1346, figs. 5*).—In this continuation of a series of papers, some of which have been noted previously (E. S. R., 58, p. 593), revised prediction curves for the basal metabolism of infants (E. S. R., 63, p. 894) are presented and compared with the standard curves of Benedict and Talbot (E. S. R., 45, p. 561) derived from the same data but smoothed by inspection. New basal metabolism data obtained on a group of 15 infants are compared statistically with the basal values predicted by the two methods.

The normality of the subjects in the present study was tested by comparisons of weight and height with the Woodbury standards for normal infants, with the conclusion that the present group was of normal height for age, but appreciably below the average body weight for age and somewhat below for height. The coefficients of correlation of the basal metabolism of these subjects with age, weight, height, and surface area were all remarkably high. The lowest value, 0.9073±0.0102, was for the coefficient of correlation between basal metabolism and age. Multiple regression equations for the various factors, with and without that of age, were developed, and predictions made from these were found to correspond closely with those estimated from the height-weight formulas of DuBois and DuBois. A nomogram was also constructed for predicting the basal metabolism of normal infants from body weight and stature. Although it is considered to have no decided superiority over the standards of Benedict and Talbot referred to height when applied to infants of normal build, it is thought to possess advantages over standards referred to a single physical character in interpreting metabolic measurements of infants of exceptional body conformation.

**Some factors affecting accuracy in the collection of data on the growth in weight of school children,** E. E. Sumner and J. Whitacre (*Jour. Nutrition, 4 (1931), No. 1, pp. 15–23*).—This contribution from the Texas Experiment Station reports the individual data upon which were based conclusions noted in a progress report (E. S. R., 63, p. 488) concerning the influence of various factors upon the accuracy of month to month weighings on growing children. "In following the weight of school children from month to month, the data here presented show that accuracy can not be attained unless, along with attention to the many other influencing factors, the child is weighed (1) in a known weight of clothing, (2) at approximately the same hour of day each month, and (3) with his urinary bladder empty."

**Studies of the metabolism of women.—V, The components concerned in the cyclic variations in the level of total non-protein nitrogen in the blood of normal women,** S. E. Erikson and R. Okey (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 715–722, figs. 4*).—This continuation of the series of papers noted previously (E. S. R., 64, p. 94) summarizes an extended series of blood analyses for distribution of nonprotein nitrogen conducted at regular intervals throughout the monthly cycle on normal women. The method followed was the same as in an earlier study (E. S. R., 56, p. 193), and the results obtained confirm those of the earlier report, indicating that "there is at the time of onset of menstruation in normal women a rise in total nonprotein nitrogen of circulating blood, varying as a rule from 5 to 15 mg. in individual cases. This increase in concentration of nonprotein nitrogen is not accounted for by urea, uric acid, creatine, creatinine, amino acid, or adenine nucleotide nitrogen. Hence it involves chiefly the 'rest' nitrogen."

**Metabolism of women during the reproductive cycle.—IV, Calcium and phosphorus utilization in late lactation and during subsequent reproductive rest,** E. Donelson, B. Nims, H. A. Hunscher, and I. G. Macy (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 675–686, figs. 3*).—This continuation of the series of papers noted previously (E. S. R., 63, p. 488) deals with the calcium and phosphorus metabolism of the same three subjects at the close of the lactation period reported on in the second and third papers, and in two of the subjects at intervals during the subsequent post-lactation period. For purposes of comparison data are presented graphically on the calcium and phosphorus balances of all three subjects throughout the various periods of the entire investigation.

At the close of the lactation period all three subjects were in negative calcium balance in contrast with the positive balances of the first two subjects at the end of the previous lactation. The calcium intake of all three subjects was high (from 2 to 4 gm. daily) and from varied sources, including milk. A comparison of the milk production in the two lactation periods showed that the former was characterized by a steady decrease in output and the latter by a continuous high output. This difference is thought to account for the differences in the calcium balances. The phosphorus balances were positive in both periods, a finding yet to be explained.

During the post-lactation period in the two subjects studied, calcium losses and phosphorus storage continued. At the twelfth month the calcium balances were still negative. "From these results it seems that the maternal organism requires many months to readjust itself after closely repeated pregnancies and long, intense lactations. Such findings demonstrate a real need for some means of accelerating the return of calcium metabolism to a plane of equilibrium or storage in mothers who have suffered a depletion during the reproductive cycle."

**Studies in calcium and phosphorus metabolism.—XI, The calculation of acid base content of the diet,** W. T. Salter, C. Fulton, and F. Angier (*Jour. Nutrition, 4 (1931), No. 1, pp. 1–13*).—This paper discusses the difficulties involved in the calculation of the acid base content of diets owing to differences in the composition of different samples of the same food, changes in the composition of foods on cooking, and the possible production of organic acids. Comparisons of calculations of the acid base balance of various diets from the standard tables of food composition with individual analyses of the total base and acid components of the same diets showed wide variations, leading the authors to conclude "there is obviously much to be desired in improvement of the calculation of potential acidity in diets. For careful metabolic work it is apparently imperative either to analyze each diet as fed, or to feed extremely simple foodstuffs. It is at least essential to employ a constant basal diet to which potentially acidic or basic additions may be made."

**Buffer values of foods,** I. N. Kugelmass and E. Greenwald (*Amer. Jour. Diseases Children, 41 (1931), No. 6, pp. 1377–1379, fig. 1*).—The buffer values of various foods commonly used in the feeding of young children were determined by dispersing weighed amounts of the food in definite volumes of water and titrating them to pH 9.5 with N/100 NaOH and to pH 3 with N/20 HCl and calculating these readings to give the amount of N/10 HCl required to change the reaction of 1 gm. of food to one unit of pH for the values determined.

Cereals, fruits, and vegetables were found to have low buffer values in comparison with milk, eggs, and meats, and cooked and processed foods lower values than the corresponding raw foods. The authors attribute the values of cereals in infant feeding partly to their low buffer capacity, and are of the opinion that "the low buffer value of fruits and vegetables combined with their ready digestibility makes them valuable from the standpoint of correcting disturbances in the acid base equilibrium in disease."

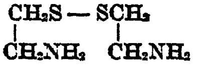
**The specific dynamic action,** G. Lusk (*Jour. Nutrition, 3 (1931), No. 5, pp. 519–530*).—In this review of recent contributions to the subject of specific dynamic action of carbohydrates, fats, and proteins, the author calls attention particularly to the fact that Rubner's theory, first expressed nearly 30 years ago, that the specific dynamic action is due to the heat production of intermediary metabolism has been justified by the evidence which has since accumulated, although in the meantime various other theories have been brought forward in explanation of this phenomenon. "Rubner's brilliant interpretation of the cause of the phenomena presented by the specific dynamic action of these different foodstuffs deserves to be recalled to-day, for it shows how a great mind, richly informed by personal experience yet held in check by due regard for facts, may have true prophetic vision of the truth which those of lesser caliber fail to perceive."

**Nutritive value of potato protein and of gelatin,** D. B. Jones and E. M. Nelson (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 705–713, fig. 1*).—The somewhat conflicting results reported in the literature on the value of potato protein in human and rat nutrition are reviewed briefly, with the suggestion that some of the poor results which were obtained when potatoes were fed as the sole source of dietary nitrogen to rats might be attributed to the low content of protein. With this in mind, a potato preparation containing only a small amount of starch was made by washing out most of the starch from finely pulped potatoes and drying this material, together with some of the unwashed pulp, to a fine powder. This material, which had a nitrogen content of 3.48 per cent, was fed to rats as the sole source of protein in a diet containing 41.3 parts of the potato preparation, 3 of salt mixture, 53.7 of dextrin, and 2 of cod-liver oil.

On this diet, which provided 9 per cent of crude potato protein, rats nearly maintained their weight for 3 weeks. The addition of 10 per cent of casein or lactalbumin to the diet produced an immediate growth response, but gelatin to the extent of 20 per cent of the diet, either alone or with a mixture of 0.2 per cent of cystine, 2 per cent of tyrosine, and 0.5 per cent of tryptophane, caused no improvement in growth rate. It is concluded that casein and lactalbumin contain some essential dietary factor which is lacking in the potato preparation and in gelatin, and that this factor is not one of the known essential amino acids.

**Cysteine and taurine as substituents for cystine in nutrition,** H. H. MITCHELL (*Jour. Nutrition, 4 (1931), No. 1, pp. 95–104*).—Following a discussion of methods which have been used to investigate the intermediary reactions of amino acids in animal metabolism and a brief review of conflicting results reported in the literature on studies of the availability of cystine derivatives, paired feeding experiments on rats are reported in which cysteine and taurine were used in place of cystine as a supplement to dried skim milk powder as the source of protein (E. S. R., 63, p. 393). The cysteine experiment was continued for 7 weeks, at the end of which time in each of the 8 pairs of rats the one receiving cysteine had made the greater total gain and attained the greater body length. The average increases in both were statistically significant. In the corresponding taurine experiment, in only 2 of the 8 pairs was the total gain of the taurine rat greater than that of the control and the reverse was true in the other 6 pairs.

It is concluded that cysteine is convertible into cystine in the animal body, but that taurine does not possess this property.

**Studies on the biochemistry of sulfur.—XI, The substitution of dithioethylamine (cystine amine) for cystine in the diet of the white rat,** M. X. SULLIVAN, W. C. HESS, and W. H. SEBRELL (*Pub. Health Rpts. [U. S.], 46 (1931), No. 22, pp. 1294–1301, figs. 3*).—Following a brief review of the literature on the indispensability of cystine in nutrition, feeding experiments on rats are reported in which dithioethylamine or cystine amine 
$$\begin{array}{ccc}CH_2S & — & SCH_2\\ | & & |\\ CH_2NH_2 & & CH_2NH_2\end{array}$$
was used in comparison with cystine as a supplement to casein in an otherwise adequate basal diet.

The rats on the basal unsupplemented diet kept the soft downy hair of baby rats to the end of the experiment, 20 weeks, and showed some depilation. On the basal diet plus cystine the hair was that of normal adult rats at the end of the experiment and there was little, if any, depilation. On the basal diet plus cystine amine the hair remained infantile for a number of weeks, but finally became normal adult hair, with little depilation. The cystine amine-fed animals gained 64.2 per cent as much in weight as those fed cystine at the same level. It is concluded that cystine amine is capable of replacing cystine to a considerable extent.

**The metabolic rate and respiratory quotients of rats on a fat-deficient diet,** L. G. Wesson and G. O. Burr (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 525–539*).—As a part of an extensive investigation of the metabolic and structural changes produced in rats by the fat-deficient diet of Burr and Burr (E. S. R., 62, p. 292), attempts were made to determine whether or not animals on this diet are able to form fat from carbohydrate and, if so, whether fat is formed when a limited amount of carbohydrate is fed in the fasting condition and thus represents an abnormal metabolism of carbohydrate. Studies were also made of the metabolic rate and respiratory quotient of rats in the various stages of the deficiency disease.

The respiratory quotients in the first hours following a carbohydrate meal were in many cases well above unity, thus indicating that fat had been formed from the carbohydrate. No relief from the symptoms of the fat-deficiency disease was secured, however, until linolic and linolenic acids were supplied. This is thought to indicate that the fat synthesized did not contain these acids.

The basal and assimilatory metabolic rates of the animals showing the early symptoms of the fat-deficiency disease were well above normal and in the later stages normal or subnormal.

The possible relationship of thyroid activity to several phases of the fat-deficiency disease is discussed.

**Utilization by normal adult subjects of the calcium and phosphorus in raw milk and in ice cream,** M. M. Kramer, M. T. Potter, and I. Gillum (*Jour. Nutrition, 4 (1931), No. 1, pp. 105–114*).—Essentially noted from a preliminary report (E. S. R., 64, p. 895).

**[Vitamin studies at the Missouri Station]** (*Missouri Sta. Bul. 300 (1931), pp. 26, 27, 81, 83, 84, fig. 1*).—Progress is noted as follows:

*The action of radio active substances on vitamins*, A. G. Hogan, R. W. Pilcher, and L. Richardson (p. 26).—It is reported briefly, without experimental data, that butter upon exposure to radioactive substances lost simultaneously its vitamin A activity and yellow color. The effect was attributed to the beta rays. When the alpha rays were screened out with mica and most of the beta rays with a thin lead plate, the remaining gamma rays did not decolorize the butter, but it was impossible to determine whether or not they reduced the vitamin A activity.

*Interrelations between the amounts of protein and vitamin B required*, A. G. Hogan, R. W. Pilcher, and L. Richardson (pp. 26, 27).—Growth curves are given of representative rats receiving ad libitum a basal diet low in protein and vitamin B and the same supplemented with (1) protein, (2) a vitamin B supplement, and (3) both protein and vitamin B. The addition of either protein or vitamin B was followed by more rapid growth, which was temporary in the case of vitamin B and more lasting in the case of protein. Growth was most rapid on the basal diet plus both protein and vitamin B. In another series of experiments not reported graphically all of the animals in each group received the same amount of food and of calories. Under these conditions an increase in the amount of protein produced definitely larger gains in weight, but this was not true of vitamin B. A ration containing 32 per cent of casein required much more yeast as the source of vitamin B to support normal growth than did a ration containing 18 per cent of casein, thus pointing to a direct ratio between the amount of protein in the diet and the amount of vitamin B required.

*The vitamin A content of June eggs*, M. C. Hessler and S. Cover (p. 81).—No difference was found between the vitamin A content of June eggs of Rhode Island Red and White Leghorn chickens as determined by the Sherman-

Munsell method. "The unit from both breeds was less than 0.036 gm. per day."

*The vitamin content of Bloomsdale spinach*, M. C. Hessler, D. Johnson, and R. B. Walsh (pp. 83, 84).—One gm. of fresh and between 5 and 6 gm. of home canned Bloomsdale spinach were found to provide 1 unit of vitamin B according to the Chase method (E. S. R., 63, p. 95). Between 2 and 3 gm. of the raw spinach, 14 gm. of spinach cooked 15 minutes, and 10 gm. of spinach canned according to the method described in Farmers' Bulletin 1471 (E. S. R., 55, p. 189) were required to furnish 1 Sherman unit of vitamin C.

**The vitamin content of three varieties of dates,** M. C. Smith and L. A. Meeker (*Arizona Sta. Tech. Bul. 34 (1931), pp. 305–317*).—Following the standard procedures developed by Sherman and coworkers, the authors have made quantitative determinations of the content of vitamins in three varieties of dates grown at the university date farm at Tempe, Ariz.—the Maktum, a soft fresh date high in invert sugar content, the Deglet Noor, a semidry cane sugar date, and the Thoory, a representative dry date. The methods of preparation of each of these varieties for market are described as follows:

"The Deglet Noor fruit was picked from the palm when it first started to become translucent, placed in a processing oven at a temperature ranging from 100 to 105° F., and held there until the fiber was completely broken down, the whole process requiring approximately 72 hours. During this maturation process the dates were dehydrated to 24–26 per cent moisture. The Maktum dates were picked from the palm when two-thirds ripened, processed for approximately 4 hours at 110° and at 125 to 136° for 7 hours, and then sterilized at 150° for 1.5 hours. Dehydration to 34–36 per cent moisture took place. The Thoory dates were allowed to ripen on the palm, then held at 100 to 105° overnight and sterilized at 150° for 1.5 hours. They are drier dates containing approximately 15 per cent moisture." All of the dates were obtained as thus prepared and kept frozen until used. Samples of the Maktum variety which had been allowed to ripen on the tree and others which had been picked before completely ripened but not matured artificially were also tested for vitamin A and tree ripened samples for vitamin C, but with no differences in results from those obtained with the regularly matured samples.

No measurable amounts of vitamins C, G, or D were found in any of the dates tested. Unit values for the other vitamins were as follows: The number of vitamin A units per pound were Maktum 454, Deglet Noor 363, and Thoory 605, respectively. The unit values for vitamin B complex were Maktum 227, and Deglet Noor and Thoory each 202 units per pound, respectively. The values for vitamin B ($B_1$) were Maktum 181, and Deglet Noor and Thoory each 151 units per pound, respectively. When these values were calculated to a dry basis, the values for vitamin A became 708 for the Maktum and Thoory varieties and 477 for the Deglet Noor. Corresponding values for the B complex were 344, 236, and 265 and for vitamin B ($B_1$) 275, 177, and 199 units per pound, respectively.

**Further investigation of quantitative measurement of vitamin A values,** H. C. Sherman and E. L. Batchelder (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 505–511, fig. 1*).—Following the general technic of Sherman and Burtis (E. S. R., 60, p. 194) and the plan followed by Sherman and Munsell in an earlier investigation (E. S. R., 54, p. 89), the authors have compared the rate of growth of groups of nine well-matched rats each on diets in which the sole source of vitamin A consisted of graded amounts of whole milk powder.

The composite growth curves showed a statistically significant lengthened survival period over the controls of the group receiving the smallest amount of vitamin A, representing only about one-fourth the quantity required for normal growth. A statistical analysis of the differences in growth rate between the groups receiving multiple doses of the vitamin, with interpolations as suggested previously (E. S. R., 64, p. 790) for values between the ones used, showed that "at levels of feeding which induce a gain in weight of about 3 gm. per week, a decrease of 25 per cent (or an increase of 33 per cent) is undoubtedly measurable by the method here used when nine or more carefully standardized experimental animals are employed at each level of feeding."

Referring to discussions by Drummond and Morton (E. S. R., 62, p. 208) and Irwin, Brandt, and Nelson (E. S. R., 64, p. 585) on the accuracy to be expected in quantitative vitamin A determinations, the authors suggest that the reason that their own estimates of attainable accuracy are higher is probably because their animals were more perfectly matched and because they used a single food source of vitamin A.

**Some surgical aspects of faulty nutrition, R. McCarrison** (*Brit. Med. Jour., No. 3674 (1931), pp. 966–971, fig. 1*).—In this lecture, the first of two delivered before the Royal College of Surgeons of England on experimental research at the Pasteur Institute, Coonoor, British India, the author describes the laboratories in which his extensive investigations have been carried on, calling attention to the absolute freedom from disease among his well-fed animals and the various pathological conditions found among the improperly fed animals, and discusses more fully the general effects of a deficiency of vitamin A and several diseases of surgical interest occurring in rats on faulty diets. In his opinion the function of vitamin A, so far as it is known at present, is "to maintain the functional integrity of the cells covering body surfaces, thereby preventing invasion of the organism by microbic agents." He emphasizes, however, his belief that "whatever the specific function of any vitamin may be, vitamins are but links in the chain of essential substances requisite for the maintenance and harmonious regulation of the chemical processes in the tissues, and their action must be considered in connection with metabolism as a whole—that is, in relation to balance of food ingredients in general, to organs of digestion and assimilation, and to endocrine regulation of metabolism. Their deficiency, like that of the other elements and complexes necessary for normal nutrition, leads to depreciation of cellular function. Depreciation of cellular function is the foundation upon which disease is built."

**Some surgical aspects of faulty nutrition, R. McCarrison** (*Lancet [London], 1931, I, No. 21, pp. 1151–1154*).—An abridged report of the lecture noted above.

**The causation of stone in India, R. McCarrison** (*Brit. Med. Jour., No. 3675 (1931), pp. 1009–1015, figs. 8*).—This lecture deals with the occurrence of stone (renal or vesicle calculus) in India, the various local factors which are considered to exert an influence on its occurrence, the experimental production of stone in rats, the chemical composition of human, rat, and cattle stones, the function of vitamin A in the prevention of stone, and the mechanism of stone formation. Vitamin A is thought to function in the prevention of stone (1) by preventing the destruction of epithelial tissues which result in the presence in the urine of desquamated epithelium which may serve as the nucleus around which the deposition occurs and (2) by preventing infection in the urinary tract. Concerning the mechanism of stone production in general, the author states that both faulty food and infection may bring on physicochemical disturbances responsible for stone deposition, but that in India at least the most important factor is faulty food.

**Observations on the assay of the antineuritic vitamin,** W. H. SEBRELL and E. ELVOVE (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 16, pp. 917–925, figs. 2*).—Hitherto unpublished data of Goldberger and some from the authors' experience are reported in confirmation of recent observations of Sandels (E. S. R., 63, p. 895) and earlier ones of Hofmeister (E. S. R., 49, p. 562) and others that certain of the polyneuritic symptoms in rats are associated with shortage rather than complete absence of the antineuritic vitamin.

The curative method of Smith (E. S. R., 63, p. 291) has been extended to subcutaneous and intraperitoneal injections with satisfactory results.

**The vitamin B and G requirements of lactation,** D. L. HUSSEMANN and R. A. HETLER (*Jour. Nutrition, 4* (*1931*), *No. 1, pp. 127–140, figs. 3*).—This is the complete report, with experimental data, of an investigation noted previously from a progress report (E. S. R., 64, p. 895).

**Are the Williams-Waterman vitamin B₃ and Randoin-Lecoq nutritional vitamin the same?** R. LECOQ (*Jour. Biol. Chem.*, *91* (*1931*), *No. 2, pp. 671–674*).—The author discusses briefly the various properties ascribed to the Williams-Waterman vitamin $B_3$ (E. S. R., 60, p. 293) and the nutritional vitamin of Randoin and Lecoq (E. S. R., 62, p. 493), both required by pigeons, and concludes that the similarities between the two vitamins "exceed their discrepancies and that they are the same."

**The comparative antirachitic and calcifying properties of irradiated milk and milk derivatives,** G. C. SUPPLEE, G. E. FLANIGAN, O. J. KAHLENBERG, and A. F. HESS (*Jour. Biol. Chem.*, *91* (*1931*), *No. 2. pp. 773–789, pls. 2, figs. 8*).—The unsaponifiable fraction of milk fat obtained from roller process dry whole milk was irradiated and tested for antirachitic and calcifying properties by the curative method with rats and the prophylactic method with chickens, with uniformly negative results. Milk of varying fat content irradiated in fluid form and subsequently dried by the double roller process was likewise tested and found to have antirachitic properties, the intensity of which was determined, with limitations, by the fat content of the milk and the period of exposure. An irradiation period of only a few seconds was found sufficient to produce a high degree of activity without detectable changes in taste and odor.

Among the possible explanations suggested for the difference in degree of activatibility of the unsaponifiable fraction and the original milk are oxidation of the provitamin prior to extraction and the failure of the solvent to free the provitamin from the nonfatty constituents of the milk powder. "These possibilities considered in the light of the markedly favorable results obtained by irradiation of the natural products present an interesting field for speculation regarding the physicochemical relationship of the provitamin to the other milk constituents."

**The effect of ultraviolet irradiation on the antiscorbutic vitamin of liquid and of dry milk,** G. C. SUPPLEE and O. D. DOW (*Amer. Jour. Diseases Children, 41* (*1931*), *No. 6, pp. 1353–1362, figs. 7*).—Liquid milk irradiated for a few seconds in a thin film showed "a slight but definitely measurable destruction of the antiscorbutic vitamin," while dry milk irradiated for periods of 3 and 20 minutes showed no evidence of such destruction. In both cases the irradiation was such as to impart definite antirachitic properties to the milk.

**Observations on persons with potential vitamin deficiency,** B. GORDON and E. FLANDERS (*Amer. Rev. Tuberc.*, *23* (*1931*), *No. 1, pp. 84–89*).—A study of the diets of over 1,000 new patients entering the clinic of the Jefferson Hospital, Philadelphia, between February 15, 1929, and April 1, 1930, showed an average intake of approximately 1,400 calories and in several instances an intake as low as from 800 to 1,000 calories daily. In most instances the diet consisted chiefly of meat, potatoes, bread, and canned vegetables. The consumption of cereals, green vegetables, and dairy products was very low.

The effects of supplementary vitamin A and D administration in the form of cod-liver oil concentrates and of a mineral concentrate prepared from anhydrous whey were studied in groups of tuberculous and nontuberculous patients. The cod-liver oil concentrate appeared to be more effective in decreasing intercurrent infections than in controlling calcium metabolism, thus suggesting that the concentrate was more valuable for its vitamin A than D content. Favorable response in weight gains and sense of well-being followed the consumption of the mineral concentrate, the effects of which were more definite than those attributed to the supplementary feeding of vitamin D.

**Effect of brain diet in pernicious anaemia,** C. C. Ungley (*Lancet [London], 1931, II, No. 2, pp. 63–67, figs. 5*).—Several case reports are given from which it is estimated that the hematopoietic potency of ox brain in pernicious anemia is approximately one-third that of ox liver.

## TEXTILES AND CLOTHING

**A controlled humidity room for testing textiles,** M. B. Hays (*Jour. Home Econ., 23 (1931), No. 7, pp. 662–668*).—This contribution from the Bureau of Home Economics, U. S. D. A., discusses the general requirements of a controlled humidity room for the physical and chemical testing of textiles, various methods of controlling humidity, and factors which must be taken into consideration in planning the equipment for a humidity room, and describes the humidity room recently equipped at the bureau. A list of manufacturers of humidity equipment and a compilation of references to the literature on the subject are appended.

**The durability of white and colored cotton materials,** A. E. Ginter and D. Rhodes (*Missouri Sta. Bul. 300 (1931), p. 83*).—The five white cotton fabrics discussed earlier (E. S. R., 63, p. 796) were laundered until completely worn and the same tests applied. The wear on white cotton fabrics due to laundering was not great, although commercial methods produced more wear than home laundering methods. This type of muslin decreased in tensile strength from 58 to 65 per cent warpwise and 67 to 71 per cent fillingwise. It appeared that shrinkage due to washing may be overcome by pressure exerted during ironing. The merits of the test methods are commented on briefly.

## MISCELLANEOUS

**Progress in agricultural research [at the Missouri Station, 1930],** F. B. Mumford, S. B. Shirky, et al. (*Missouri Sta. Bul. 300 (1931), pp. 107, figs. 16*).—This contains the organization list, a report on the work and publications of the station, and a financial statement for the Federal funds for the year ended June 30, 1930. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

# NOTES

**Arizona University and Station.**—M. T. McGeorge, research chemist in soils in the station, has been appointed acting head of the department of chemistry and soils.

**California University and Station.**—Recent appointments include Dr. Max W. Gardner, chief in botany in the Indiana Station, as professor of plant pathology and plant pathologist, effective March 1; Dr. W. H. Busic as associate in veterinary science, effective January 15, to investigate causes of the high rate of mortality in pullets that is causing serious losses in the poultry districts of the State; Dr. Percy M. Barr, in charge of the research division of the British Forest Service, as lecturer in forestry for the period from January to May, 1932; Arthur F. Pillsbury as junior irrigation engineer in the station, effective March 1, to carry on some special irrigation investigations in the Imperial Valley; and Roderick Craig, associate in biochemistry in the university, as instructor in insect physiology and junior insect physiologist.

**Connecticut State Station.**—Jenkins laboratory, for which funds were appropriate at the last session of the general assembly, is under construction. It will house the departments of entomology, botany, forestry, and plant breeding and will relieve the present badly crowded conditions. The building will be colonial in type, with two stories and basement, of red brick trimmed in limestone, and surmounted by a small central dome. It will be long and narrow, 124 by 45 ft. and set to afford north light in the windows of the laboratory rooms. Individual workrooms are provided for most of the research staff. It is expected to be ready for occupancy June 1.

Instruments for recording weather conditions have been installed on the station farm in Mount Carmel. These will record the velocity of wind, minutes of sunshine, humidity, temperature, and the amount of rain and snow.

Following conferences with the extension service, in which special measures were planned to inform farmers in the control of plant and insect pests, mounts of important plant diseases have been supplied to each of the county agents. As life history of specimens of the more important economic insects can be collected, these also will be mounted for the county agents.

Neely Turner has been appointed assistant entomologist.

**Connecticut College and Storrs Station.**—George Herbert Lamson, jr., dean of the division of agricultural science, professor of zoology and geology, and station zoologist, died December 5, 1931, in New York City. Dean Lamson was born in Malden, Mass., on April 8, 1882. He graduated from the college in 1902 and the Massachusetts College in 1903, and received the M. S. degree from Yale University in 1905. Aside from service in 1905–6 as professor of biology in Tarkio College, his work had been carried on entirely in Connecticut, since 1910 as professor of zoology and since 1908 as zoologist in the station. In the latter capacity he had made many important studies in parasitology, including the sheep stomach worm and its control, factors in the incubation of eggs, and the poisonous effect of the rose chafer on chickens.

Dr. Howard D. Newton, professor of chemistry, has been appointed dean of the division of agricultural science.

**Georgia College and Station.**—The new home economics building at th college has been completed. This is a three-story brick and tile structur 210 ft. long, with end wings 88 ft. deep and center bays 62 ft. deep. Over a acre of floor space is provided, including a cafeteria seating 250 and a banquet room annex accommodating 50, a lecture and assembly room seating 300 experimental cookery and foods laboratories, classrooms, etc.

W. T. Zeigler has been appointed to a station fellowship to be supported by the Paperboard Industries Association.

**Idaho University and Station.**—John L. Toevs has been appointed superintendent of the Aberdeen Substation vice A. E. McClymonds, resigned to take up irrigation farming in north California. Ralph S. Bristol, State seed commissioner and extension agronomist, has resigned to become agronomist for the Indian Service.

**Kentucky University and Station.**—The resignations are noted of J. E. Pelphrey, assistant in chemistry; J. S. Kring, forest ranger; and Earl K. Borman, bacteriologist. Z. L. Galloway, field agent in farm management, has been appointed instructor in farm management in the university and assistant in farm management in the station. Other appointments include G. H. Wiggin as forester at the Robinson Substation and George S. Terry as bacteriologist.

**Massachusetts College.**—John D. Willard, extension specialist in marketing in 1919 and director of the extension service from 1920 to 1926, died at Amherst, Mass., on December 22, 1931. Prof. Willard was born in Appleton, Wis., on May 31, 1885, graduating from Amherst College in 1907 and receiving the M. S. degree from the Massachusetts College in 1925. He was also a student in the Hartford (Conn.) Theological Seminary for two years and held rural pastorates for nine years. In 1926 he became director of continuing education in the Michigan College. Since 1928 he had been research associate and rural specialist for the American Association for Adult Education and professor of education in Teachers College of Columbia University.

**Michigan College and Station.**—W. K. Kellogg of Battle Creek has supplemented previous gifts (E. S. R., 59, p. 697; 60, p. 600) by the presentation of a tract of 360 acres of abandoned farm land near the Kellogg Wild Life Sanctuary for purposes of demonstrating the proper reforestation of submarginal forest land in southern Michigan. This tract will be administered by the department of forestry, which will reforest about 40 acres annually for the next 10 years, using various species of trees and cultural practices. P. A. Herbert has succeeded the late A. K. Chittenden as head of the department, with H. S. Newins as associate professor and A. B. Bowman as instructor.

The appointments are noted of Dr. P. J. Schaible as research assistant in chemistry in the station and Dr. L. M. Turk as assistant professor and research assistant in soils, both effective January 1.

**Nebraska Station.**—The station has obtained an additional 160 acres of land for the substation at Scottsbluff. Approximately 65 acres of this tract is under irrigation and from 30 to 40 acres more can be irrigated by pumping.

**Rutgers University.**—Robert C. Clothier, dean of men in the University of Pittsburgh, has been appointed president, assuming the duties of the office on March 1.

**New Mexico College and Station.**—Carl Englehorn has been appointed assistant agronomist vice H. N. Watenpaugh, whose resignation has been previously noted.

**Cornell University.**—Robert Morrill Adams, assistant extension professor of vegetable gardening since 1920, died December 12, 1931. Prof. Adams was born in Hill, N. H., on May 28, 1882, received the B. S. degree from Lebanon University in 1903, the A. B. degree from Yale University in 1906, and the

M. A. degree from Columbia University in 1926. He had had considerable high school teaching experience in the Philippines and in Massachusetts and served as examiner in the U. S. Civil Service Commission from 1913 to 1915 and as translator, editor, and assistant horticulturist in the U. S. Department of Agriculture from 1917 to 1919. He was perhaps best known as the author of Rude Rural Rhymes and other poems which were widely syndicated, and had recently completed a similar volume, The Old Timer.

**North Dakota Station.**—At the last session of the legislature appropriations were made for a plant pathology greenhouse and a rebuilding of the steer feeding shed. These improvements have now been completed.

The greenhouse is 20 by 63 ft. and divided into three sections. Two sections are heated with "speed" heaters and the other with steam coils under the benches. Both the heating and ventilation are under automatic control, and extensive artificial illumination will be used. The head house contains a well-equipped laboratory and a basement in which are being installed four refrigeration chambers for accurate temperature control.

The steer feeding shed, which was the oldest building on the campus, has been rebuilt on the same site to utilize the silos and the steer feeding yards. An annex was added, making available much-needed facilities for the continuance of the animal nutrition investigations. The nutrition shed will accomodate four groups of steers of ten each.

**Ohio State University and Station.**—According to the *Agricultural Student*, the College of Veterinary Medicine has been reorganized on a divisional basis and with a revised curriculum. Beginning with the fall of 1933, the entrance requirements will be increased. The extension program has been greatly augmented, and an affiliation with the station has been arranged to permit of combined activities at the Serum Institute at Reynoldsburg and elsewhere.

**Tennessee University and Station.**—S. A. Hinton has been appointed instructor in dairying in the College of Agriculture and assistant dairyman in the station.

**Virginia Station.**—Dr. Roy A. Ballinger, associate agricultural economist, has resigned to accept a position at the Oklahoma College and Station, effective January 1.

**Virginia Truck Station.**—Jackson B. Hester of the New Jersey Stations has been appointed soils technologist, and Lauren D. Anderson assistant entomologist, effective February 1 and March 1, respectively.

**Wisconsin University and Station.**—A cooperative agreement has been entered into by the station and the U. S. Department of Agriculture providing for the establishment and operation of a soil erosion experimental farm. Under this cooperative arrangement the State of Wisconsin furnishes the farm on which the experimental work is to be conducted, while the Department, through its Bureaus of Chemistry and Soils and Agricultural Engineering and the Forest Service, provides the funds for carrying on the research and operating the farm.

The farm is located on a high ridge four miles east of La Crosse and has the soil and slope characteristics which make erosion a serious problem on millions of acres of farm land in western and southwestern Wisconsin, northeastern Iowa, and southeastern Minnesota. About 80 of the 160 acres of the farm are now in cultivation, and about the same area is in woodland pasture. The topography is such that all the water running off the farm can be measured in five gullies which drain the tract, thus providing easy means of determining accurately the relative efficiency of water-holding methods being tried out on various parts of the farm, together with a measurement of the silt carried away in the run-off water. There is a wide variety of slope in the different fields, thus permitting the laying out of experimental plats in variations in slope from nearly level to very steep. At least two of the gullies draining the farm are actively cutting back into the soil and thus represent a challenge in terms of repairing the effects of destructive erosion.

Most of the emphasis of the research, however, will be on means of erosion prevention rather than cure. Engineering structures such as soil terraces and soil management methods such as strip planting will be tried out under conditions that will permit the accurate measurement of their effectiveness in preventing erosion. Because dairying is the chief enterprise followed by the farmers of the region, it is planned to maintain a dairy herd on the experimental farm, and most of the crops raised will be marketed through the dairy herd (corn silage, hay, small grains, etc.), The herd will aid in the research in connection with the development of satisfactory methods of using the steeper slopes for pasture purposes. The roughest land will be devoted to timber growing under the general supervision of the Lake States Forest Experiment Station.

A detailed topographical map of the farm was made during the fall to provide an inventory of the farm's present status and its possibilities. In the spring the engineering devices for erosion control and measurement, as well as the experimental plats, will be laid out on a basis of the plans worked out cooperatively by the Department and the station.

A grant of $12,500 has been made to the university by the Kelco Company of San Diego, Calif., to be used in an industrial fellowship study of the nutritional value of dried kelp for farm animals, particularly poultry. The project is to be assigned to the departments of poultry husbandry, agricultural chemistry, and animal husbandry, and feeding experiments will be conducted to study the value of ground dried kelp as a supplement to the livestock ration to supply iodine and other salts and certain vitamins.

An industrial fellowship in soils established by the Ruhm Phosphate and Chemical Company of Tennessee has been renewed on an enlarged basis to extend the study of soil phosphates and to make possible the completion of the bibliography and digest of the world's literature pertaining to the use of phosphates in plant production which has been in process of compilation for the past two years.

The agronomy building which has now been completed is a three story fireproof structure 165 by 50 ft. It will be devoted to offices, laboratories, and classrooms, including quarters for the department of plant pathology.

*Science* announces that in honor of the late Dr. S. M. Babcock hollyhock gardens will be planted on the grounds of the agricultural colleges and experiment stations in at least 44 States. Seeds gathered from Dr. Babcock's own garden in the fall of 1931 will be used. A Babcock garden is also being planted at the University of Göttingen, at which he completed his training, as well as at Tufts College, from which he was graduated in 1866.

Dr. C. A. Herrick, assistant professor of zoology in the College of Letters and Science, has been appointed assistant professor of zoology and veterinary science and will spend half of his time in the leadership of a Purnell research project dealing with internal parasites of poultry, particularly coccidia. This project is cooperative between the departments of veterinary science and poultry.

**Wyoming University and Station.**—A project has been started whereby agricultural college and home economics students attending the university may earn at least a part of their expenses. Wyoming wool is scoured and carded by the boys, and comforts and sleeping bags are made by the girls. These articles are displayed at State and county fairs, and many orders have been received for them.

Two dairy barns have been completed which are now in use on substations of the State experiment farms department at Afton in the Star Valley and Lyman in the Bridger Valley. These barns will house 35 head of cattle and provide room for 100 tons of hay.

Dr. J. S. Wiant, instructor in agronomy and assistant agronomist and plant pathologist, has accepted an appointment in the inspection of fruits and vegetables with the U. S. D. A. Bureau of Agricultural Economics with headquarters in New York City, and will be succeeded by G. H. Starr. Robert H. Burns, assistant wool specialist, has returned from 15 months' study in the University of Edinburgh.

**Macaulay Institute for Soil Research.**—This institute was established in Scotland in 1930 through the initiative of T. B. Macaulay of Montreal, Canada. Following the purchase and endowment by Mr. Macaulay in 1929 of land for a peat-land demonstration farm on the island of Lewis in the western Hebrides group, provision was made for the opening of laboratories on the mainland where research connected with Scottish soils in general could be conducted. The institute was accordingly incorporated under a committee of management of 11 members selected by the Department of Agriculture for Scotland and the Scottish agricultural colleges.

A tract of about 50 acres situated at Craigiebuckler on the outskirts of Aberdeen was acquired and equipped with funds contributed by Mr. Macaulay. A large mansion house on the property was fited up into offices, a library, laboratories, and similar purposes. A range of greenhouses was already available, and a cage for pot experiments was constructed in the 2-acre walled-in garden. The fields are being laid out into plats to study the effects of lime and different systems of cultivation and manuring, but it is expected that much of the field work of the institute will be carried on in other parts of the country representative of the various soil types.

Funds for the maintenance of the work are at present being provided by the British Development Commission. Close cooperation is being maintained with other institutions in both research and advisory work. The institute has taken over the lysimeter studies of the North of Scotland College of Agriculture at Craibstone, and there have been some curtailments and readjustments at other institutions with a view to the concentration of soil investigations to a large extent at the institute. It is thought that a well-equipped soil institute with an adequate staff will be in a much better position than isolated workers in several different centers to deal with the intricate problems of the very variable soils of Scotland.

In addition to the joint work with the colleges, there will be an increasing amount of collaboration with other research institutions, as in nutrition problems connected with deficiencies in certain soils. The institute is already cooperating with the Scottish Animal Diseases Research Association in questions of malnutrition of mountain sheep and with the Scottish Plant Breeding Station regarding grasses suitable for peat land.

The present staff of the institute consists of a director, Dr. W. G. Ogg; a secretary; a soil geologist; specialists for moorland work, soil surveys, and drainage analysis; a technical assistant; and a part-time surveyor and advisory officer who lectures at the West of Scotland College during the winter months. Later it is hoped to add a bacteriologist, an ecologist, and an engineer.

**New Journals.**—*Bûlleten Inostrannoĭ Tekhniki i Organizatsii Sel'skogo Khozíàĭstva* (Bulletin of Foreign Technic and Farm Management) is a new journal published monthly by the International Agrarian Institute, Moscow.

The object of the journal is set forth as to acquaint Russian agricultural specialists with the organized technical progress and achievements in the various fields of the agricultural industry in the progressive western European and American countries. The subject is to be discussed under the following headings: Farm management, agricultural production, agricultural industrialization and mechanization, electrification and agricultural production, storage and transportation of agricultural products, agrarian policies, letters to the editor, and notes and bibliography. The initial number contains the following articles: Agricultural Mechanization and the Increase in the Productivity of Labor, by N. Nazar'evskii (pp. 3–9); A Short Report on Grain Farming in the Dry-Farming Country of the United States, by A. Bereznin (pp. 9–18); Electrification of the Agricultural Industry (pp. 19–29); Drying Alfalfa Artificially, by V. Khorst and T. Kissel'bakh (T. A. Kiesselbach) (pp. 29–32); Experiments in Drying Hay Artificially, by S. Nadler and S. Osterberger (pp. 32–35); Harvesting with Combines in Germany (pp. 35, 36); The First Combine in Sweden (pp. 36, 37); and A New Method for Pasteurization of Milk (Stassano Method) (pp. 37, 38).

The Imperial Council of Agricultural Research of Calcutta is reorganizing its series of publications. The *Agricultural Journal of India*, the *Journal of the Central Bureau for Animal Husbandry and Dairying*, and the memoirs and bulletins of the Imperial Department of Agriculture in India are to be discontinued, and three new journals established in their stead. One of these is *Agriculture and Live Stock in India*, which will for the present be issued bimonthly for general circulation. *Indian Journal of Agricultural Science* will also be issued bimonthly, while *Indian Journal of Veterinary Science and Animal Husbandry* will appear quarterly. These two latter publications will be primarily for the publication of scientific material. All three journals will contain abstracts.

*Journal of the Faculty of Science, Hokkaido Imperial University*, is issuing Series III, Chemistry, and Series V, Botany, from time to time. Their initial numbers contain the following original articles: Series III, Sex Differences from the Standpoint of Biochemistry, Part I, by T. Tadokoro (in English) (pp. 1–179), and The Diverse Forms of Sulfur, by H. Tominaga (in German) (pp. 181–183); and Series V, Experimental Studies on Bladder-Cell Formation in *Aspergillus oryzae*, by T. Sakamura (pp. 1–26); Notes on some Japanese Algae, I, by Y. Yamada (pp. 27–36); and Studies on the Resorption of Urea by Root *of Zea mays* Seedlings in Sterile Culture, by S. Yamaguchi (pp. 37–55). The first of the articles in Series V is in German and the remainder in English.

*La Technique Agricole Internationale* is a quarterly review published by the International Federation of Technical Agriculturists at Rome. The initial issue, a double number, is devoted largely to a report of the first international conference of this group, held in Rome, November 23–27, 1930, information regarding technical agricultural workers and their organizations in various countries, and the following original articles: The Fertiliser Position and European Agriculture, by Sir Daniel Hall (pp. 6–17); A Technical Service for Colonial Agriculture, by E. Leplae (pp. 18–40); Agricultural Machinery: Net Cost of work, Limits of Use, by G. Bouckaert (pp. 41–50); and The Soul of Food and the Food of the Mother, by G. Tallarico (pp. 51–56).

*Revista de Entomologia* is being published quarterly at Sao Paulo, Brazil. While it will be devoted to insects in general, its special field will be the neotropical fauna of Brazil. A bibliographical section will present abstracts of similar material. The initial number contains nine original articles, one of which, by C. H. T. Townsend, is entitled Notes on American Oestromuscoid Types (pp. 65–104).

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EXPERIMENT STATION RECORD

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## EDITORIAL

### NEW POLICIES FOR EXPERIMENT STATION RECORD

Reference has recently been made in these columns to the discussion before the experiment station division of the Association of Land-Grant Colleges and Universities of possible changes in policy of *Experiment Station Record.* This discussion was opened by a paper presented by the editor of this publication in which it was suggested that " an effort should be made to determine whether the *Record* is meeting the needs of its constituency as effectively as possible, and if not the directions in which improvement should be effected."

In response to suggestions by members of the section, soon after the convention a questionnaire upon this subject was prepared by the Office of Experiment Stations and distributed to the directors of the various State experiment stations as representative of one of the most important groups of the *Record's* immediate clientele. This questionnaire invited suggestions regarding deficiencies in general, and inquired somewhat specifically regarding such matters as the optimum length and scope of abstracts, the relative usefulness of the editorials and news notes, the problems presented by the stations' annual reports, the possibilities of using closer spaced type and other changes in typography and make-up, the extent of inconvenience resulting from the omission from the individual issues of the detailed table of contents and the list of experiment station and Department publications, and the wisdom of further restriction of the free distribution of the *Record.*

Although the task of replying to this questionnaire was appreciable, the response from the stations was remarkably prompt and general. Up to the present time, replies have been received from no fewer than 46 of the States. As in most cases the questionnaires were circulated among the stations' staffs, the replies were doubtless representative of the research as well as the administrative points of view. The findings are regarded as exceedingly valuable and helpful, and the *Record* welcomes the opportunity of expressing its deep appreciation of the cooperation rendered by all who participated in the inquiry.

As would be expected, differences of opinion were revealed as to the desirability of some of the proposals, but in the main these differences dealt mainly with matters of detail, for which further consideration is evidently desirable. On what may be termed the fundamental issues, the replies developed a high degree of unanimity.

The usefulness of the *Record* was widely attested, and there was strong demand for its continued development along the general lines which had been followed in the past. Despite the shortage of space, the inclusion of editorials on the present basis or in more abbreviated form was advocated by directors generally, as well as by many staff members. Changes in typography tending toward a less legible product were not favored, and there was little support for a further condensation of abstracts of station bulletins or of contributions to scientific journals.

Two shortcomings in the *Record* abstracts were unmistakably revealed—delay in the publication of certain material and an incomplete covering of certain important sections of the field. Both of these difficulties have long been recognized and traced to a common cause—inadequate personnel and inadequate space for the publication of the flood of material which is increasingly available. The practical problem was succinctly stated in the report of the acting chief of the Office of Experiment Stations for the fiscal year ended June 30, 1931, as follows:

"As its name implies, the distinctive function of the *Experiment Station Record* is to present an epitome of the results obtained by the experiment stations in this country and by the United States Department of Agriculture. These results are embodied in publications issued by over 50 widely scattered institutions at irregular intervals and are regarded by librarians and others as exceptionally difficult to keep track of. During the past year the *Record* published abstracts of 925 publications of the stations and 373 from the Department, using a system of assignment whereby each was abstracted as completely and expeditiously as possible, and the abstracts were assembled for publication substantially on a chronological basis. In this way the results of station and Department research were made available promptly and systematically all over the world.

"In recent years the quantity and importance of this published work of the stations and the Department have greatly increased, and the policy of giving precedence to the abstracts of this material has resulted in its absorption of more and more of the space in the *Record*. This has unfortunately resulted in a corresponding reduction in the space available for abstracts from other sources. . . . Although a total of 5,606 abstracts appeared in the current volumes, the completeness of the review in certain fields, especially in the newer lines of inquiry, necessarily fell short of what could have been obtained under more favorable circumstances."

Probably no complete solution of this problem is to be expected with the existing space limits, but the replies to the questionnaire have indicated the possibility of some improvement by a change in policy as regards the handling of the annual reports of the stations. This change will involve a marked departure from previous policies and will present some difficulties, but it is the most promising readjustment which at present seems feasible.

Originally utilized by most of the stations as a medium for the publication of the results of much of their experimentation in complete and final form, many of their reports have in recent years been compiled with other objectives. Some have become essentially administrative statements of progress, reporting no results and therefore requiring only general mention in the *Record*. Others, however, have included more or less detailed summaries of their principal findings during the year. Often these are prepared primarily for local distribution, and while based on memoranda supplied by the investigators or the heads of their respective departments, not infrequently they are compiled by others. In some cases they deal with work already more fully reported elsewhere or eventually to be so reported, but other data which may or may not be published separately are also included and this is very difficult of differentiation.

In the past it has been the aim of the *Record* to abstract all new material regardless of the medium of its publication. This policy is logical and has been indorsed in many replies to the questionnaires as helpful and desirable, but in practice it is unquestionably resulting in the crowding out of more important material. Because of this result not a few of the replies advocate the omission of the reports entirely, but such a course seems open to question in view of such considerations as priority and the inclusion of data never duplicated elsewhere.

The procedure which will be tentatively adopted is less radical, though nearly as economical of space. Abstracts of the annual reports will no longer contain the results of the investigations, and the work will merely be described in sufficient detail to insure appropriate index entries. Thus, instead of comprehensive accounts of the season's work at the Illinois or Pennsylvania Stations the abstracts will be limited to such statements as that results are reported of variety tests with wheat or potatoes, breeding investigations with corn to increase oil content, and comparisons of nitrate of soda and sulfate of ammonia for tobacco; that results are reported of pruning methods with apples or raspberries; or that notes are presented on the life history of the codling moth or the fire blight organism or as to methods of control of hog cholera.

This plan should serve to call to the attention of workers in the various fields the fact that the data have been published, but will eliminate details of much that is inconclusive and ephemeral. For certain sections the change in policy will have little significance, but in others it will lead to important readjustments, and for the *Record* as a whole promises substantial reductions in the large amount of space which has hitherto been allotted to the publications of the stations. It is hoped to utilize this space so far as possible for the additional abstracts of research by other agencies which have been so generally requested in the questionnaires, and particularly to amplify and extend the review of work appearing in foreign languages and in relatively inaccessible publications. In this way the field should be covered more promptly and more completely. The change is expected to become effective with the next volume, which begins with the July issue. Comment as to its operation will be very welcome.

### DEATH OF DR. C. FORD LANGWORTHY

Users of the *Record* during the period from 1895 to 1923 should readily recall Dr. C. Ford Langworthy, who died in Washington, D. C., on March 3, 1932. For about 13 years Dr. Langworthy carried on the abstracting in foods and animal production, and later he was long associated with the section of foods and human nutrition. He was thus a prolific contributor to this journal, as well as to many other publications of the Department, and gained wide recognition as an authority on the literature of foods and nutrition and the progress of education and research in this and related fields.

Virtually all of Dr. Langworthy's active career was spent with the Department. He was born in Middlebury, Vt., on August 9, 1864, and received from Middlebury College the A. B. degree in 1887, the A. M. degree in 1890, and the honorary D. Sc. degree in 1912. He was also granted the Ph. D. degree by Emperor Wilhelm University at Strasbourg in 1893, and for the two years following served as assistant and instructor in chemistry under Dr. W. O. Atwater in Wesleyan University.

Although Dr. Langworthy's early service to the Department was mainly as a member of the *Record* staff, his activities soon became much broader in scope and his abstracting was increasingly overshadowed by other duties. In 1905 he succeeded Dr. Atwater as chief of the nutrition investigations of the Office of Experiment Stations and continued in this capacity until the establishment of the States Relations Service in 1915, when he became the first chief of the Office of Home Economics. In 1923 this office was reorganized as the Bureau of Home Economics, and from that time until his retirement in 1929 his position was that of specialist in home economics.

As chief of nutrition investigations, Dr. Langworthy continued and supervised cooperative nutrition studies with a number of experiment stations and other institutions, the work including dietary studies, digestion experiments with many foods, and more fundamental investigations with improved forms of the original Atwater-Rosa respiration calorimeter. He was also greatly interested in the popularization of knowledge pertaining to human nutrition, and prepared personally or in collaboration with others a large number of Farmers' Bulletins and similar publications on foods and their use in the diet which received wide distribution and extensive utilization by teachers, dietitians, and housewives. His store of information on such topics was enormous, and it was freely drawn upon for encyclopedias, scientific and popular journals, lectures, and in other ways.

An early advocate of home economics instruction and research, he took a prominent part in the formation and early work of the American Home Economics Association and its *Journal of Home Economics*, serving as vice president of the organization from 1909 to 1912. Later, as chief of the Office of Home Economics during the important period of the World War and its aftermath, he mobilized the activities of the Department for home economics investigations. Under his direction the digestibility, nutritive value, culinary qualities, and use of animal and vegetable fats and the home canning and drying of fruits and vegetables were investigated. War-time studies of the digestibility, preparation, and use of wheat substitutes were made. A broad survey of the dietaries of people in different parts of the country was conducted in cooperation with the Bureau of Markets. Experiments with reference to the energy expended in household labor were continued in the large respiration calorimeter, and the small calorimeter was further used for experiments relating to the ripening of fruit, the incubation of eggs, and the wintering of bees. A limited survey was made of labor conditions in farm homes, and methods were tested for prolonging the wear of clothing and household textiles and on the treatment and care of wooden utensils, furniture, and floors. Thus with limited funds and under difficult conditions he laid the foundations for development and expansion under a bureau status.

So widespread has now become popular interest in matters pertaining to food and other phases of home economics and so eminent its leadership that it is easy to forget how recent development has been and how serious were the handicaps which confronted the pioneers in the cause. Dr. Langworthy began his work when reliable information was limited and objectives uncertain. He did much to aid in overcoming these obstacles, and thereby helped greatly to put the new movement on a high plane and a sound scientific basis. His services were important and timely and merit wide remembrance.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**Modified methyl red and sodium alizarin sulfonate indicators,** A. H. Johnson and J. R. Green (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 2–4*).—Following a brief summary of previously published reports on the mixture of nonindicator dyes with indicators, the authors of this contribution from the Montana Experiment Station note the results as compared with those given by the indicators alone of titrations of the excess acid in Kjeldahl determinations of total protein in flour.

The use of several blue and greenish-blue dyes with methyl red and with sodium alizarin sulfonate was found to effect an increase in the accuracy with which the end point can be determined in titrating acids and bases. The most satisfactory proportions in which to combine indicator and dye are given, the object being in each case to obtain the sharpest end point possible and not to change the pH range of the mixture of indicator and dye from that of the indicator alone.

Methylene blue or guinea green gave the best results with methyl red. Guinea green or indigo carmine gave the best results with sodium alizarin sulfonate.

**Rapid determination of nitrogen peroxide in nitrogen peroxide-air mixtures,** C. W. Whittaker, F. O. Lundstrom, and A. R. Merz (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 15–18, fig. 1*).—In this method, reported from the Bureau of Chemistry and Soils, U. S. D. A., the accuracy is found to be equal to that of ordinary gas analysis. Possible sources of error and necessary precautions are discussed. The samples were measured at 156° C., at which temperature the dissociation of $N_2O_4$ into $NO_2$ was found practically complete, while further dissociation, $NO_2$ to nitrous oxide and oxygen, was still inappreciable; and the gases were confined over a commercially available mineral oil found to be very mobile at the temperature specified, not readily attacked by nitrogen peroxide, and of a vapor pressure low enough to meet the requirements of the purpose in hand.

**The solubility of phosphates in neutral ammonium citrate solution,** K. D. Jacob, K. C. Beeson, L. F. Rader, jr., and W. H. Ross (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 2, pp. 263–283*).—The solubility in neutral ammonium citrate solution of the phosphate content of 64 widely varying types of phosphatic substances is here reported in a contribution from the Bureau of Chemistry and Soils, U. S. D. A.

"When the weight of sample was decreased by 0.5-gm. steps from 2.0 to 0.5 gm., there was a progressive and significant decrease in the percentage of citrate-insoluble phosphoric acid in di- and tricalcium phosphates, trimagnesium phosphate, heavily ammoniated superphosphates, raw, steamed, and naphtha-extracted bone, basic slag, and calcined phosphate. Dimagnesium phosphate and magnesium ammonium phosphate were completely soluble in citrate solution when 2.0-gm. samples were used. Pure dicalcium phosphate and trimagnesium phosphate were completely soluble in citrate solution when 1.0-gm. samples were used, but both of these materials contained small quantities of citrate-insoluble phosphoric acid when the weight of sample was increased to 1.5–2.0 gm. Calcium and magnesium pyrophosphates prepared by igniting dicalcium phosphate and magnesium ammonium phosphate, respectively, were only slightly soluble in citrate solution. Calcium hydroxyphosphate was approximately one-third as soluble as tricalcium phosphate in citrate solution. Approximately 65–75 per cent of the total phosphoric acid in tricalcium phosphate was insoluble in citrate solution when 2.0-gm. samples were used, but when the weight of sample was reduced to 0.5 gm. only about 18–36 per cent of the total phosphoric acid was insoluble. Under similar conditions, the solubility of the phosphoric acid in raw, steamed, and naphtha-extracted bone approximated closely the solubility of the phosphoric acid in tricalcium phosphate. The samples of c. p. iron and aluminum phosphates used in this investigation contained 1.0–55.5 per cent of the total phosphoric acid in the form of citrate-insoluble phosphoric acid when 2.0-gm. samples were used, and significant decreases in the percentages of citrate-insoluble phosphoric acid were not obtained by decreasing the weight of sample. Impure iron and aluminum phosphates precipitated from crude phosphoric acid by sodium carbonate and by ammonia were almost completely soluble in citrate solution. Decreasing the weight of sample from 2.0 to 0.5 gm. did not bring about a significant decrease in the percentages of citrate-insoluble phosphoric acid in superphosphate and other acidulated phosphates that had not been treated with ammonia, or otherwise reverted." Some further observations of a similar character are recorded.

**The Neubauer method as applied to the determination of the availability of phosphate materials,** S. F. Thornton (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 2, pp. 292–295*).—Report is made from the Indiana Experiment Station upon the availability of 13 phosphate materials both in an acid soil and in neutral sand, studied by an adaptation of the Neubauer method (E. S. R., 50, p. 118).

"While there is a poor correlation between such results and the results obtained by the Official neutral ammonium citrate method. the correlation with the results of pot tests is such as to indicate that the Neubauer method gives very valuable information as to the true availability of different phosphates. With this method it is possible to study the influence of varying conditions, such as pH, soil type, combination with other fertilizer materials, etc., without consideration of which a determination of actual availability appears impossible."

**Determination of carbon dioxide in soil carbonates—a modification of the Official method,** W. M. Shaw (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 2, pp. 283–292, figs. 2*).—Trials of the time and aspiration rate necessary in the Official method for the complete recovery of carbon dioxide from standard samples of limestone and dolomites are reported in a communication from the Tennessee Experiment Station, together with the statement that "the addition of stannous chloride to the hydrochloric acid made possible a rapid and complete decomposition of carbonates in soils by the application of heat without serious interference from organic matter." The procedure and apparatus are detailed in full, as well as illustrated by diagrams of the assembly used.

**A study of some methods of examining flour, with special reference to the effects of heat.—I, Effects of heat on flour proteins,** C. W. Herd (*Cereal Chem., 8 (1931), No. 1, pp. 1–23, figs. 4*).—Imbibitional power, acidity effects, dough acidity changes during fermentation, protein solubility, the use of ultra-violet radiation in detecting heat-treated flours, and the importance of moisture in observations of the effects of heat on the proteins of flour were included among the subjects of experiment in an investigation here reported as a part of a thesis presented to the University of London.

"Kent-Jones' viscosity curves in 1:10,000 auramine are confirmed, but it is shown that bacterial development and increase in acidity take place, and, therefore, no measurement is afforded of the proteolytic activity of the flour itself. Viscosity changes, however, may give a measurement of the resistance of the proteins to proteolytic attack. Incubation in pH 3.0 lactic acid did not completely inhibit bacterial growth. The viscosity curves are very different from those in water. Incubation in the presence of 1 per cent ammonium fluoride solution gave apparently no bacterial growth, the viscosity decrease in the untreated flour was less, and the viscosity increase in the strongly heated flour was also less. Viscosity-acidity curves show interesting differences in the unheated and the strongly overheated flours, giving evidence of marked physical changes in the flour proteins. Many of the well-known bactericidal substances were found to be insufficient for inhibiting the growth of bacteria in flour-water suspensions.

"Various methods for the estimation of glutenin gave fairly good agreement between one another. The sum of the three fractions of proteins by recognized methods of analysis did not agree in many cases with the total protein figure determined directly on the flour. In good grade flours the sum is usually lower than the total, whereas in the lower grade flours the sum is frequently higher than the total. Different salts have different peptizing effects on some of the flour proteins. A subsequent alcohol extraction will vary according to the preliminary salt treatment, indicating that the so-called 'gliadin' is not a characteristic entity. The solubility of all proteins in their respective solvents is diminished by severe heating, indicating increased resistance to peptization.

"Ultra-violet radiations do not apparently fulfill any useful purpose in cereal analysis.

"If a large proportion of the natural moisture of a flour be removed at a low temperature and then the heating performed, the effects on the flour proteins will be produced, but at a very much slower rate."

**Wheat and flour studies.—XVII, Factors influencing the viscosity of flour-water suspensions. IV, The effect of extraction with solutions of the potassium and sodium halides,** A. H. Johnson (*Cereal Chem., 8 (1931), No. 1, pp. 39–43*).—This series of investigations of the Montana Experiment Station is here extended to cover the relative effects of the iodides, bromides, chlorides, and fluorides of potassium and sodium.

"The viscosities of flour-water suspensions extracted with 1.0 and 0.5 N solutions of the potassium and sodium halides are higher than those of similar suspensions extracted with distilled water. The viscosities decrease according to the lyotropic series of the anion I>Br>Cl>F. Glutenin is not removed on extraction of a flour suspension with the halides of potassium and sodium."

**The march of acidity in stored flour, II,** M. C. Markley and C. H. Bailey (*Cereal Chem., 8 (1931), No. 1, pp. 29–38, fig. 1*).—This second contribution extends the range of the work noted from the first report (E. S. R., 63, p. 109) "through the use of a larger number of flours in order to ascertain the relative consistency of the rate of change of acidity among flours of the same relative grade or degree of extraction. . . .

"A higher correlation of ash content with acidity, as determined by the A. O. A. C. method was found in freshly milled flours than of ash content with acidity determined by the Greek method. Difference between Greek acidity and

A. O. A. C. acidity in freshly milled flours was highly correlated with ash content. Earlier assumptions that the A. O. A. C. tentative method for acidity indicated the relative rate of production of acid-reacting substances during the extraction with water received support from these recent studies. Rate of change in acidity of flours stored at 25° C. was highly correlated with ash content. It was estimated that flours containing the percentages of ash included in the four grades or qualities described in the present Greek specifications will contain in excess of the maximum limits of acidity after 43 to 52 days when stored at 25°."

**On the coloring matters of milk** [trans. title], M. Lundborg (*Biochem. Ztschr.*, *231* (*1931*), *No. 4–6*, *pp. 274–289*).—The natural yellow color of butterfat was found to be carotene, the unaltered fat giving the characteristic carotene spectrum. The direct determination of the carotene content by means of the Lovibond tintometer method applied to the concentrated fat is regarded as undependable, however, by reason of the minuteness of the quantity of carotene present. A safer procedure was found to consist in determining the carotene in the saponification residue. Detailed directions for the carrying out of a saponification suited to the purpose and a subsequent determination in the tintometer of the color content of the unsaponifiable matter are given, together with a statement of the technic employed in the tintometry of the carotene concentrate.

The extraction of the milk fat was also studied, a modification of the Roese-Gottlieb method being found best adapted to the purpose of the subsequent saponification and tintometry above mentioned.

**Method for hydrogen ion determination of butter**, O. F. Hunziker, W. A. Cordes, and B. H. Nissen (*Jour. Dairy Sci.*, *14* (*1931*), *No. 4*, *pp. 347–372*).—In this paper the authors present the results of a study of methods for determining the hydrogen-ion concentration of butter. A simple procedure for the preparation of the butter samples and for the application of the quinhydrone electrode to the hydrogen-ion determination is described. Because of the nonconductivity of the butterfat, the curd-serum portion of the butter was used in these determinations.

It was found that the quinhydrone electrode gave essentially the same results on butter as the standard hydrogen electrode. Dilution of the butter or the curd-serum mixture produced marked changes in the pH values obtained. Removing the curd from the curd-serum mixture tended to lower the pH value slightly.

**The effect of lipins on the fat test of buttermilk**, E. W. Bird and G. C. Sands (*Jour. Dairy Sci.*, *13* (*1930*), *No. 6* *pp. 453–460*) —According to the conclusions recorded in this contribution from the Iowa State College, sulfonation occurs in the Babcock test with the production of an error "at least double that due to lipin materials." With regard to the effect of lipins in the application of some other methods to fat determinations, the following among other statements are made:

"When buttermilk is dried before it is extracted, the lipin material seems to be destroyed or at least it is not wholly extracted by ether or by petroleum ether from the dried product. This fact, together with the fact that the average of lipin analyses reported is 0.149 per cent, appears to account for the 0.15 per cent higher fat percentage by the Rose method than by the Soxhlet method on dried buttermilk. . . . The macro Roese-Gottlieb extraction method used throughout this work gave weights of fatty material which are in agreement with the Roese-Gottlieb analyses of the buttermilk.

"Lipin materials were found in the extracts in quantities ranging from 14.89 to 25.64 per cent of the weight of the extract, with an average of the values

21.79 per cent. The percentages of the weight of the buttermilk that was lipin ranged from 0.103 to 0.176 per cent, with an average of the values 0.149 per cent. These figures are in close agreement with the values reported by Chapman, which were 20.25 per cent of the weight of the extract and 0.1302 per cent of the weight of the buttermilk."

**Note on the determination of citric acid, P. A. Clifford** (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 2, p. 298*).—Applying the Hartmann and Hillig method (E. S. R., 64, p. 511) for the determination of citric acid to coffee samples, the author of this contribution from the Food and Drug Administration, U. S. D. A., found that substances soluble in alcohol and ether were precipitated in conjunction with the pentabromacetone. He obtained accurate results by volatilizing the acetone derivatives in a current of warm air drawn through the Gooch crucible after the first weighing of the impure precipitate, a second weighing after the aeration permitting a satisfactory determination of the weight of the pentabromacetone by difference.

**A quantitative study of the determination of the antineuritic vitamin B, E. F. Chase and H. C. Sherman** (*Jour. Amer. Chem. Soc., 53 (1931), No. 9, pp. 3506–3510, fig. 1*).—The method described has been noted essentially from another source (E. S. R., 63, p. 95). Attention is called particularly to the necessity of standardizing the autoclaved yeast to be used as the source of vitamin G. "both as to completeness of destruction of vitamin B and adequacy of vitamin G value of the resulting product. It is plainly advantageous that the yeast selected for this purpose should be of high original vitamin G value and of low original vitamin B value and acidity."

It is emphasized, moreover, "that a merely routine repetition of experiments of a 'standard' description is not sufficient to insure a truly quantitative result, even with large numbers of animals. Large numbers of animals are needed to offset individual variability, but it is also important that each laboratory attempting quantitative work shall also establish experimentally the adequacy of its own standardization of materials and methods." The unit of vitamin B corresponding to that of vitamin G, as noted below, is defined as "that amount which, when fed as a daily allowance to a standard test animal (rat), under such conditions as have been indicated above, will suffice to support 3 gm. per week of gain in weight during an experimental period of not less than 4 nor more than 8 weeks."

**Quantitative determination of vitamin G ($B_2$), A. Bourquin and H. C. Sherman** (*Jour. Amer. Chem. Soc., 53 (1931), No. 9, pp. 3501–3505, fig. 1*).—In the method described the basal diet is essentially that of Sherman and Spohn (E. S. R., 51, p. 368), with the exception that the 80 per cent alcoholic extract of ground wheat to serve as the source of vitamin B is dried on the starch in such proportions as to introduce the extract of 50 gm. of the wheat into each 100 gm. of the air-dried food mixture. The basal diet is fed to 4-weeks-old rats without additions until their weight becomes constant, about 2 weeks, after which the material to be tested is given in graded doses. In the experiments reported, skim milk powder was fed at four different levels as the test material. One rat from each litter was kept on the basal diet alone, and several animals, from 11 to 16 in the experiments reported, were fed each level of the material. A gain of 3 gm. a week per rat was considered the most satisfactory, and consequently the unit of vitamin G has been defined as "the amount which when fed as a daily allowance induces a gain of 3 gm. per week in an experimental animal standardized as here described and fed a basal ration which is sufficiently freed from vitamin G to result in loss of weight during the test period."

Attention is called to possible sources of error in the method resulting from shortage of some of the other factors now considered to be present in the vitamin B complex. To safeguard against possible shortage of the Reader vitamin $B_4$, it is recommended that the extract serving as the source of B ($B_1$) be evaporated "at the low temperature permitted by the use of a highly efficient vacuum pump." The possible exhaustion of the bodily stores of other growth-promoting essentials not provided in the basal diet is guarded against by the adoption of the relatively small gain in weight of 3 gm. per week and by limiting the test period to from 4 to 8 weeks.

It is noted that the principles of the method may be followed, using other materials as the source of vitamin B. "Quantitative testing for vitamin G values can not yet safely be formulated as a merely mechanical routine, but it can serve as a means of advancement of knowledge through carefully conducted and critically interpreted research."

**A study of Travers' method for the estimation of fluorine with reference to insecticides,** C. M. Smith, E. H. Hamilton, and J. J. T. Graham (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 2, pp. 253–260*).—The Travers' method, essentially a conversion of the fluorides present to potassium silicofluoride, which is then filtered off, washed, and titrated with standard alkali according to the equation $K_2SiF_6+4KOH=6KF+SiO_2+2H_2O$, was modified to the extent of the substitution of powdered silica gel for potassium silicate as a source of silicon for the first reaction, the use of a lesser excess (0.5 cc. in place of 2 cc.) of hydrochloric acid at the same stage, and in the addition of alcohol to the reaction mixture and wash solution. The resulting procedure has been found satisfactory "for the analysis of sodium fluoride alone and in mixture with many of the ingredients ordinarily found in proprietary insecticides.

"Iron causes slightly low results, and appreciable quantities of aluminum and boron compounds render the method useless. Pyrethrum powder causes slightly high and lead arsenate somewhat higher results. The method given is more rapid than most of the other methods in common use and . . . as accurate."

**Method for the determination of lead and copper in Bordeaux-lead arsenate mixtures,** J. C. Bubb (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 2, pp. 260–262*).—"The fact that lead arsenate is insoluble and copper and calcium compounds are soluble in dilute acetic acid suggested the use of this acid as a means of separating the lead and copper in such a mixture." The samples occasionally retained some copper, however, when extracted with dilute (1+2) acetic acid alone, and the proposed direction prescribes, therefore, (1) the addition of 0.5 gm. of calcium arsenate to each 1-gm. sample to insure the presence of the lead as the acid arsenate and (2) the addition of concentrated nitric acid, drop by drop, until just sufficient has been used to clear the insoluble residue of any blue color. The added nitric acid is then to be neutralized almost completely with ammonium hydroxide. after which lead and copper are to be determined in the insoluble residue and in the filtrate, respectively, in the usual way (the lead as chromate, the copper iodometrically).

**Potentiation of toxicity of strychnine by quinine,** R. I. Grantham and J. C. Munch (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 2, pp. 295–297*).—The authors discovered, in attempting the physiological assay of strychnine in mixtures of the first named alkali with quinine, that the toxicity of the strychnine was markedly augmented by the presence of quinine, an observation which was found to "suggest an intramolecular combination of quinine and strychnine which is more toxic than either constituent alone. The development of such a complex might also explain the difficulty encountered in attempts at chemical separation."

## METEOROLOGY

**Climate and agricultural soil culture in Starkenburg and Rheinhessen** [trans. title], H. RÜHL (*Ber. Oberhess. Gesell. Nat. u. Heilk. Giessen, Naturw. Abt., 14 (1931), pp. 1–93, figs. 16*).—This report describes the natural conditions of the region and discusses the relation of climate to soil culture, use of fertilizers, and choice of crops, as indicated by temperature, rainfall, and phenological conditions. A considerable list of references to similar investigations is given.

**Bioclimatic experiments to study the causes of variations in the content of medicinal plants** [trans. title], W. HECHT (*Heil u. Gewürz-Pflanzen, 14 (1931), No. 1–2, pp. 15–50*).—Studies of variations in growth and content of medicinal principles in ethereal-oil, alkaloidal, and glucosidal plants under different conditions of soil, climate, and other environment showed little soil influence but a pronounced and prompt response to microclimatic conditions and changes, especially with ethereal-oil and alkaloidal plants.

Numerous references to literature relating to the subject are given.

**Phenological observations in 1930** [trans. title], H. BOS ET AL. (*Landbouwk. Tijdschr. [Amsterdam], 43 (1931), No. 526, pp. 868–889, pl. 1, figs. 3*).—Continuation of observations relating to plants and birds carried on under the auspices of the Netherlands Phenological Society is reported.

**Photochemical measurements of light intensity in two common vegetation types in tropical Africa, by means of the improved Eder-Hecht photometer,** J. PHILLIPS, J. D. SCOTT, and J. Y. MOGGRIDGE (*Roy. Soc. Edinb. Proc., 51 (1930–31), No. 2, pp. 150–161*).—A year's measurement of light intensity with an Eder-Hecht photometer showed a high value of the blue-violet-ultraviolet rays in both fully exposed and lightly shaded areas in Tanganyika Territory and indicated the utility of the instrument for ecological studies.

**Commensurate unities in natural laws: Duration of sunshine and soil temperature; precipitation and stream levels** [trans. title], J. SCHUBERT (*Forstarchiv, 6 (1930), No. 15, pp. 289–292, fig. 1*).—By means of mathematical calculations and formulas, the author establishes what he considers to be definite correlations between duration of sunshine and soil temperature and between precipitation and stream levels.

## SOILS—FERTILIZERS

**The laws of soil colloidal behavior.—VI, Amphoteric behavior,** S. MATTSON (*Soil Sci., 32 (1931), No. 5, pp. 343–365*).—Soil colloids, according to the results recorded in the present contribution to this New Jersey Experiment Stations series (E. S. R., 65, p. 513) on the physics and chemistry of the colloidal substances of the soil "in which the ratio of silica (or other acid groups) to sesquioxides is low, show a pronounced amphoteric behavior. When this ratio is high the materials do not react amphoterically with the neutral salt anions and cations within the usual pH range of soils. All soil colloids react amphoterically with the phosphates. The isoelectric point is not a fixed point, but varies with the dissociation of the compounds which the colloidal complex forms with the adsorbed ions. The fact that the soil colloids react as acids above a certain pH and as bases below this pH leads to the development of an exchange acidity in the first case and an exchange alkalinity in the second case. The transition point between the two forms of reaction is termed 'the point of exchange neutrality.' Here the anion and cation adsorption balance each other. The point of exchange neutrality is not a fixed point, but is governed by the energy of displacement of the anions and cations which displace the OH and H ions in the electrodialized free ampholytoid. . . .

"Related to, and determined by, the amphoteric nature of soil colloids is their ultimate pH, defined as the pH of the completely electrodialyzed materials, i. e., the free acid-base-ampholytoids. The relation of the ultimate pH to the neutral point, to the isoelectric point, and to the acid and basic strength of the amphoteric colloids is discussed. Various types of amphoteric colloids are discussed. The activity concept is applied to the $\frac{\text{acidoid}}{\text{basoid}}$ ratio of soil colloids."

**Further observations upon the nature of capillary rise through soils,** H. A. Wadsworth (*Soil Sci., 32 (1931), No. 6, pp. 417–433, figs. 9*).—In extension of work recorded in a previous contribution (E. S. R., 56, p. 415), the author of the present paper from the Hawaii Experiment Station reports some evidence that capillary rise of water through inert sands and through soils is a compound process, dominated in the first phase by an action which may result in a complete filling of the pore spaces, and in the latter phase by an action which results in a continuous, uniform decrease in moisture content.

"When coarse, inert materials are used, the transition between these two processes can be noted by inspection of the log. rise-log. time curve. With fine materials inspection of the moisture distribution is required. The minimum moisture content reached by true capillary distribution in soils is about the maximum field capacity. Subsequent movement is at a very slow rate and must be attributed to other causes. It seems clear that soil moisture under normal field conditions can not possess much motility, since such moisture contents are rarely more than the maximum water-holding capacities of the soil in question."

**The moisture equivalent as a measure of the field capacity of soils,** F. J. Veihmeyer and A. H. Hendrickson (*Soil Sci., 32 (1931), No. 3, pp. 181–193, figs. 6*).—In a contribution from the California Experiment Station, data are reported which indicate that the moisture equivalent is a close measure of the field capacities of fine-textured soils for moisture. but not always of sandy soils. The moisture equivalent can be used to indicate the field capacities of deep, drained soils with no decided changes in texture or structure, with moisture equivalents ranging from about 30 per cent down to about 12 or 14 per cent. Below from 12 to 14 per cent, the moisture equivalent seems to be less than the field capacity. Inasmuch as the structure of the soil has also been shown to influence markedly the field capacity, this factor must likewise be considered in using such measurements.

The moisture equivalent seems to give a single-value determination closely related to texture, at least for the fine-textured soils, in spite of the fact that the structure of the sample used in making the moisture equivalent determination may be changed from that found in the field. The ratios of moisture equivalent to permanent wilting percentage for more than 60 soils ranged from 1.4 to 3.8. Both high and low ratios were found with sands as well as with clays. The results also show that the moisture equivalent is a relative measure of the moisture-holding capacity of fine-textured soils.

Further data show that the moisture content of soil from 2 to 3 days after irrigation does not change materially in the next few days. It is concluded that there is a rather definite soil moisture content which, if measured within 2 or 3 days after a rain or an irrigation, may be assumed to be the field capacity, if there are no discontinuities in structure or texture present and in the absence of a water table.

A list of 24 references to other work bearing on the subject is included.

**Relation of pH drift to moisture content and base held in soils,** A. T. Perkins and H. H. King (*Soil Sci., 32 (1931), No. 6, pp. 409–416, figs. 2*).—Graphic and numerical data contributed from the Kansas Experiment Station show that at the soil-water ratios commonly used exchangeable base has no influence on potential drift; that the amount of water contained by the soil apparently influences the degree of pH drift, the moist soils having a larger drift than the dry soils, especially in the case of a 2-minute, or longer, period; and that the drift of pH is variable with degree of dilution, the greater the dilution the greater the drift.

**The effect of temperature on the exchange-acidity of low-land soils,** K. Kawamura (*Utsunomiya Agr. Col. Bul. 1 (1931), pp. 27–46*).—Acid soils were treated with normal potassium chloride solution at temperatures of 4, 16, 26, and 36° C. and the titratable acidity and aluminum and iron contents were determined in the extracts. The reaction between the soil and potassium chloride solution was completed for the most part within one hour when the mixture was vigorously shaken, but at low temperatures it took over six hours to establish a complete equilibrium. Peat, and rice-field soils which contained more or less organic matter, liberated ferrous iron in the neutral salt solution, its amount increasing markedly with rise of temperature. High- and dry-land soils did not set free any iron even at high temperature.

The amount of aluminum liberated in the neutral salt solution decreased with rising temperature in most cases of low- and wet-land soils. In most cases of low- and wet-land soils, the titratable acidity decreased with rising temperature. In some cases of peats, a maximum acidity seemed to be attained at 26°. The acidity of high- and dry-land soil decreased invariably with rise of temperature. Mineral acid soil showed no general tendency to be affected by the temperature.

Aluminum and ferrous humates were prepared from crude humic acid from peat and cane sugar and treated with normal potassium chloride solution at various temperatures. "The results were that the effect of temperature was quite analogous with that on the reaction between low- and wet-land soils and KCl solution. That is, the liberation of aluminum somewhat decreased and that of iron markedly increased with rise of temperature." Possible interpretations of these results are discussed in some detail.

**The effect of treating with HCl of varying concentrations on soil acidity as measured by the KCl method,** K. Kawamura (*Utsunomiya Agr. Col. Bul. 1 (1931), pp. 1–26, figs. 12*).—On repeated treatment of the soil studied with 0.1 N hydrochloric acid the soil acidity, as measured by extraction with potassium chloride solution of the soil washed after the acid treatment until the water extract was neutral, rose to a maximum and thereafter fell off with further repetition of the acid treatment. The secondary drop in soil acidity was attributed to a gradual diminution of the colloid content of the soil. "The titratable acidity of the KCl extract of the soil which was treated with HCl agreed fairly well with that calculated from the quantities of aluminum and iron contained in the extract." When one part of soil was treated with three parts of hydrochloric acid of varying normalities at 100° C. for one hour, "the titratable acidity . . . increased rapidly with increasing concentration of the HCl until it reached a maximum point," beyond which it decreased gradually with further increase in the concentration. Soils of similar nature gave similarly shaped acidity curves—the curves obtained by plotting the resulting acidity against the concentration of hydrochloric acid.

"The normality of HCl which gives a maximum acidity varies with the nature of soil. Such normality is found lowest in the case of field soil containing an adequate amount of humus. Existence of humus seems to render a soil capable of giving its maximum acidity at a point of very low concentration of HCl. Subsoil gives a maximum acidity at higher concentration than surface soil. This difference is attributed to the difference in amount of bases occurring in the soils. The acidity of soil rich in sand is comparatively low. More or less weathered mineral can be converted into exchange acid, while a fresh one gives no effect with the treatment with HCl. There are two kinds of soil which give markedly high acidity. One is rich in organic matter and the other high in inorganic colloids, indicating that the exchange acid is closely related to such organic and inorganic colloids."

**Effects of sorghum plants on biological activities in the soil**, A. D. McKinley (*Soil Sci., 32 (1931), No. 6, pp. 469–480*).—The following statements cover the major observations recorded in this contribution from the Iowa State College:

"Larger amounts of carbon dioxide were produced in cropped than in uncropped soils, the largest amounts occurring when the plants were making their greatest vegetative growth. The production of carbon dioxide was related to the growth characteristics of the plants and distinct for each of the plants. Increased numbers of filamentous fungi were found under corn and decreased numbers under kafir, wheat, and barley. Larger numbers of bacteria and actinomycetes occurred in planted than in unplanted soils, the largest numbers being found under corn. Increased numbers of microorganisms were not accompanied by increased evolution of carbon dioxide in fallow soils.

"The plants made their largest draft on soil nitrates at the periods of maximum vegetative growth. There were indications that the growing plants may have increased the nitrifying and nitrogen assimilating powers of the soils to a slight extent, but the differences were not significant. Corn and kafir seem to decrease the H-ion concentration of the soil solution.

"Although growing plants may produce changes in the quantities of water-soluble phosphorus and water-soluble organic matter, significant differences could not be detected by the methods used. It appears likely that part of the increased numbers of microorganisms found under the growing plants were the result of the excretion of soluble organic matter by the growing plants. The results obtained in these investigations indicate that conditions for microbial activities are somewhat more favorable under corn, wheat, or barley than under kafir."

**Factors affecting nitrates in soils**, J. W. Ames (*Ohio Sta. Bimo. Bul 153 (1931), pp. 232–244*).—Variation in nitrate content within the plat was investigated in the case of 1/ -acre plats from which 22 samples each were taken for separate and composite determinations. The mean figures from the separate determinations agreed closely with that representing the nitrate content of a composite sample, indicating that "the nitrate content, as determined, closely represents the actual amount present in the soil of a 1/20-acre plat." It is noted, however, that "the considerable variation in nitrates of individual samples emphasizes the necessity of taking a large number of samples in order to obtain a fairly accurate invoice of the nitrate supply of a given area."

Samples taken to indicate the effect of a corn crop showed that "assimilation by the growing corn from the more restricted area close to the plants has lowered the nitrate level appreciably," and with reference to the effect specifically of differences in the quality of the stand that "the nitrate content of soil adjacent to the good stand of corn was less than the amount present between the rows or in soil adjacent to hills of poor corn. The uniformly higher content in soil adjacent to the hills of poor corn does not indicate that deficiency of available nitrogen was responsible for the poor growth of corn on these plats."

Seasonal variations and the effect of treatment with crop residues were also included among the subjects of investigation, the resulting conclusion being that "seasonal weather conditions and removal by crops have apparently had a greater effect on the nitrate content of these soils than did the treatments." As to the further factors soil reaction and a previous hay crop, the inferences are (1) that "there is evidence that nitrification may be stimulated where the reaction of the soil is changed by addition of liming materials," and (2) that "the effect of soybeans, as compared with clover and alfalfa, on the nitrate content of the soil is shown by the smaller accumulation of nitrates in the soil on which the previous hay crop was soybeans."

**Further studies on the adsorption by humic acid, K. Kawamura** (*Utsunomiya Agr. Col. Bul. 1 (1931), pp. 47–56, figs. 2*).—"Humic acid was isolated from Kurokawa peat and purified by reprecipitation from its alkaline solution and subsequent washing with alcohol and ether. One gm. of 'humic acid from peat' was treated with 100 cc. of $Ba(OH)_2$ and NaOH of varying concentrations, and the relation between the adsorption and the concentration was examined at the equilibrium state of the reaction.

"Humic acid from peat behaved in quite the same manner as 'humic acid from cane sugar' toward bases. That is, 1 gm. of the former took up the whole of the base as long as the initial concentration did not reach about 3 equivalent millimols per 100 cc.; that is, the final concentration was found to be zero, indicating the formation of a definite compound, humate. And beyond that point the humate formed further adsorbed the remaining base. The adsorption-concentration diagrams of the bases by humic acid from peat were nearly the same as those by humic acid from cane sugar. . . .

"Both humic acids from cane sugar and from peat took up only aluminum and almost no chlorine from $AlCl_3$ solution, and the amount of aluminum taken was practically constant after it reached about 0.7 (in the case of humic acid from peat) or 0.8 equivalent millimol (in the case of humic acid from cane sugar) per 1 gm. of humic acid, indicating the formation of aluminum trihumate." The aluminum taken up remained in combination with the humic acid after washing with hot water until the wash water showed no chlorine reaction. The aluminum humate showed a slow increase in exchange acidity with increase in the quantity of $AlCl_3$ applied, becoming constant at a point nearly coinciding with the point where aluminum trihumate appeared to be formed.

**Effect of replaceable sodium on soil permeability, A. E. Harris** (*Soil Sci., 32 (1931), No. 6, pp. 435–446, figs. 3*).—Report is made of a study of calcareous soils carried out at the Utah Experiment Station with a view to ascertaining the relation between soil permeability and replaceable sodium. The results indicated that the permeability decreases exponentially as the sodium content increases.

"When free from alkali that soil higher in humus is more pervious than the calcareous horizon. The reverse is true, however, when the soils are Na saturated. The effect of long-time leaching on replaceable sodium and soil permeability is deduced. The time values given . . . serve as a guiding theory for the reclamation of calcareous alkali soils. For the surface horizon and leaching with water containing approximately 35 p. p. m. of calcium, one obtains 18.8 years as the time required to reduce replaceable sodium from 88 to 10 per cent. A corresponding reduction for the calcium carbonate horizon could be realized in 15.6 years. Seven years would be required to obtain a reduction from 50 to 10 per cent." Data to show the reduction in replaceable sodium as a result of continuous leaching under field conditions are presented.

"The results indicate that a faster rate of reclamation is possible under field conditions than is indicated by the laboratory work. The data, however, are not voluminous enough to obtain a factor by which the rates given . . . could be discounted" to obtain a value that would be comparable to field conditions.

**Replaceable iron and aluminum in soils,** P. E. Turner (*Soil Sci., 32 (1931), No 6, pp. 447–458, figs. 4*).—The experiments reported in this contribution from the Imperial College of Tropical Agriculture, Trinidad, consisted essentially of an investigation into the influence of H-ion concentration and of the state of unsaturation upon the replaceable iron and aluminum content of (1) a fawn-colored river alluvium and (2) a "red-weathering clay."

"Replaceable aluminum is invariably present only in soils with pH values less than 5.1. The relationship between the H-ion concentration of the soil and the quantity of replaceable aluminum is very irregular. The amount of replaceable aluminum appears closely related to the magnitude of the saturation deficit. Aluminum is not found in the filtrate until the deficit attains a minimum value of 8.25 m. e. ['milligram equivalents per 100 gm. of soil']. Until the deficit reaches 15.5 m. e., it increases slowly in quantity. Above 15.5 m. e. the increase is extremely rapid. The amount of aluminum replaced at any given saturation deficit may vary with soil type. Indications exist that replacement of aluminum is wholly indirect in soils with pH values greater than 5.1 (the maximum recorded pH value corresponding to a saturation deficit of 15.5 m. e.). At lower pH values direct replacement may also occur, but indirect replacement appears to predominate. Between the deficits 8.25 and 15.5 m. e. the ratio of replaceable hydrogen to aluminum is of the order of 50. The rapid fall in the ratio at greater deficits suggests that the replaced aluminum may be equivalent in amount to the exchange acidity in highly unsaturated soils. The measure of relationship between the amount of replaceable aluminum and the degree of unsaturation of the soil is small.

"Iron does not appear in measurable quantity in the filtrate until the saturation deficit attains a value of 10 to 12 m. e. None of the soils examined appear to possess a pH value low enough for iron to become directly exchangeable. The relationship between thiocyanate color and soil acidity has been reinvestigated. It has been found that the intensity of color is more closely related to the pH value of the soil than to the saturation deficit."

**Field method for lime requirement of soils,** R. H. Bray and E. E. De Turk (*Soil Sci., 32 (1931), No. 5, pp. 329–341, fig. 1*).—The authors of this contribution from the Illinois Experiment Station, having found that at about 80 per cent of saturation of the base-exchange capacity a pH value of 6.5 to 7.0, satisfactory for sweetclover production, may be expected, reason that "if an indicator could be found whose color change comes at about this pH, one could then take a soil whose degree of saturation and base-exchange capacity are unknown, shake separate portions of it with a salt solution with varying known amounts of base, and determine what amount of base is necessary to bring about the desired change in color of the indicator," the cation of the salt used replacing the H-ion content of the base-exchange complex with the formation of an acid which will be neutralized by the base added. "Experiments have shown that when KCl is the salt used, and $Na_2CO_3$ is the base used, this end point can be determined on soils of varying base-exchange capacities and degrees of saturation by the use of bromothymol blue. The intermediate green to green-blue color of this indicator gives the end point for this determination. The procedure used was adopted after numerous trials with various salts, different indicators, and varying amounts of water."

On this basis of theory and experiment, two methods were elaborated, the one for laboratory use in which 5-gm. samples of air-dried 10-mesh soil were treated in test tubes each with 1 gm. of potassium chloride and with sodium carbonate solution containing either 0.0062 gm. of sodium carbonate monohydrate or an integral multiple of this quantity (equivalent to 1 ton of calcium carbonate to the acre of 2,000,000 lbs. of soil), together with bromothymol blue to indicate in which tube the nearest approach to the desired pH value has been made; the other for field use and providing for the use of compressed tablets of sodium carbonate monohydrate and potassium chloride, for a measuring cup to replace the balance in sampling the soil, and for other adaptations of the technic to field conditions.

**The determination of lime requirement by the direct addition of calcium carbonate, G. P. Percival** *(Soil Sci., 32 (1931), No. 6, pp. 459–466, pl. 1, figs. 2)*.—In a contribution from the New Hampshire Experiment Station the author shows it to be possible, "from interpolation on the laboratory curve and by the use of a factor depending on the amount of organic matter. . . . to calculate how much lime to apply in the field in order to obtain a definite pH"; and the marked advantage of liming to a definite pH value, in view of the facts that it is not necessary to lime to pH 7.0 and that crops vary from one to another in their soil pH requirements, is pointed out.

"The Truog method [E. S. R., 43, p. 622] gives lower results," with the exception of one soil. "This soil was low in organic matter. There was more than a ton's difference on some of the farms, and as these results were consistently low and since there was a personal element involved in reading the color, the Truog was considered unsatisfactory. The Jones method also gave low results even though the factor 1.8 was used. However, this may be due to the need of a larger factor for New Hampshire soils. The results are better than with the Truog method, and, with a factor that varied with the type of soil, better results would be obtained. The lime requirement as determined by the pH was based on the type of soil, as determined by the Bouyoucos hydrometer method [E. S. R., 57, p. 710], and a table prepared by Morgan, using alfalfa as the test crop." The results are for the most part better than with the Jones method.

"The hydrolytic acidity results agreed best with the calcium carbonate figure. As in the Jones test calcium acetate was used, but the longer and more thorough mixing with the soil, together with the different method of calculation, accounts for the improved results. From the exchange acidity results it is evident that New Hampshire soils contain very little exchange acidity, and in the majority of cases it can be disregarded as a factor to be considered when a field is to be limed."

**A method of increasing the manurial value of bone phosphate, N. D. Vyas** *(Imp. Inst. Agr. Research, Pusa, Bul. 204 (1930), pp. 21, pl. 1, fig. 1)*.—Inoculated composts of bone dust with sulfur and sand to improve the aeration of the mixture showed after 23 weeks an increase in phosphate availability (solubility in ammonium citrate solution) from an initial value of 17.76 per cent of the total to 92.8 per cent. The phosphate availability of an uninoculated compost reached less than 55 per cent in the same time. Charcoal, at first added to absorb a disagreeable odor produced during the process, further increased the rate of solubilization of the phosphate. Nitrogen availability was found also to increase in the sulfur compost.

Pot experiments with wheat showed increases in yield of the grain over that from an unfertilized control of 28.75 per cent from the compost with sulfur, sand, and charcoal, 20 per cent from superphosphate, and 16.25 per cent from bone dust-sulfur-sand composts prepared without the use of the charcoal. Field plat experiments yielded similar indications with respect to the value of the compost.

A recommended compost mixture was made up from 100 parts each of bone meal and sand, sulfur 25 parts, water 20 to 25 parts, and charcoal 6 to 7 per cent of the weight of the compost. This mixture required to be kept moist but protected from rains for six months, after which it was ready for use as a fertilizer.

## AGRICULTURAL BOTANY

**Plant sociology, fundamentals of the science of vegetation,** J. Braun-Blanquet (*Pflanzensoziologie, Grundzüge der Vegetationskunde. Berlin: Julius Springer, 1928, pp. X+330, figs. 168*).—This book, No. 7 of the Biologische Studienbücher, edited by W. Schoenichen, deals in the first main section with the bases of plant communal life, in the second and much larger part with plant societies and studies thereon in a systematically analytical manner.

**Soil water relations as fundamental in plant growth, II** [trans. title], H. Gradmann (*Jahrb. Wiss. Bot., 71 (1929), No. 5, pp. 669–782, figs. 14*).—A second main part, following up that previously noted (E. S. R., 64, p. 211), deals generally with the dynamics of soil water, including more particularly a general account of soil water movement, method and means of control of water supply and movement rate, and numerical data in some detail.

**The necessity and function of manganese in the growth of Chlorella sp.,** E. F. Hopkins (*Science, 72 (1930), No. 1876, pp. 609, 610*).—The author reports that the growth of *Chlorella* sp. was increased from 10 to 600 fold by the addition of 1 part of manganese to 5,000,000 parts of culture solution. Increasing the quantity of manganese decreased the growth.

Both iron and manganese are considered essential to the growth of the plant. The necessity of manganese and its toxicity is explained by the statements that sufficient manganese must be present to insure the reoxidation of the iron after its reduction by the organism, and a large amount of the element either results in too high a concentration of ferric ions or prevents its reduction by the organism.

**Manganese and the growth of Lemna minor,** E. F. Hopkins (*Science, 74 (1931), No. 1926, pp. 551, 552*).—In continuation of his work with unicellular organisms, the author found that manganese was necessary for the growth of Lemna both when iron was added to or withheld from culture solutions. The author's experiments, which were repeated a number of times, are held to show conclusively that manganese is an essential element for Lemna and to suggest that it is possibly necessary for the growth of all green plants.

**Potassium deficiency in sugar cane,** C. E. Hartt (*Bot. Gaz., 88 (1929), No. 3, pp. 229–261, figs. 14*).—In this paper, dealing with the effect of varied amounts of potassium upon the growth, enzyme activity, moisture percentage, sugar content, cellular structure, and microchemistry of sugarcane, it is stated that cane started from cuttings in October and transplanted in November began to evidence potassium starvation in March, showing decreased growth, die-back, and deficiency in chlorophyll development, it being possible to secure a gradation in growth correlated with the amount of potassium used. Quantities varying directly with the amount of potassium were weight of tops, blades, sheaths plus stems, roots, length of tops, breadth of leaf, and girth of stem. The potassium-deficient plants had the longer roots. The amount of potassium needed by sugarcane for its usual physiological processes was less than that in Shive's solution (E. S. R., 36, p. 328).

Quantitative determinations were made of the activity of diastase, invertase, peptase, ereptase, and catalase in tops, blades, sheaths plus stems, and roots. Potassium may show a plus, minus, or zero effect as to increase of enzyme activity, the influence varying with the kind, age, and organ of the plant used. Potassium-deficient plants showed their greatest diastase activity in their tops, sheaths plus stems, and blades, root activity being equal in all the plants. Invertase activity in the blades was greater in the control than in the potassium-deficient plants, the activity in stems plus sheaths being equal. Peptase activity in blades, in sheaths plus stems, and in roots was greatest in the controls. Ereptase activity was the same in all the plants. Catalase activity was greater in the plants supplied with potassium, except in the roots, where it was equal in all plants. Since equalizing the potassium content of cane blades does not equalize the invertase activity, it is thought that potassium may play a rôle in that enzyme.

The tops of potassium-deficient plants showed less moisture than did the controls. Potassium-deficient plants had greater percentages of total sugars, reducing sugars, and sucrose than had the plants which were supplied with potassium. Greater lignification occurred in the potassium-deficient plants, greater cutinization in the potassium-adequate plants. Lack of potassium was associated with abnormal distribution of the root-pith vessels, small size of vessels and parenchyma cells in the stems, large cavities in the root cortex, and underdevelopment in the root hairs.

Suggestions are offered as to the various causes of the symptoms of potassium starvation, also as to the greater resistance to low temperatures and diseases where found in plants supplied with potassium, and as to the linking, into a chain of cause and effect, of several derangements which are noted.

**Toxic effect of boron on fruit trees,** A. R. C. Haas (*Bot. Gaz., 88 (1929), No. 2, pp. 113–131, figs. 13*).—It is regarded as now well established that certain concentrations of boron are indispensable to growth in certain or all plants, though toxicity results with slight percentage increase. Kelley and Brown have shown (E. S. R., 60, p. 628) that boron is sufficiently present in certain soils and irrigation waters in southern California to injure severely citrus and walnut trees, and study by the present author has developed symptoms in the leaves of certain fruit trees similar to those in certain California orchards.

Boron is toxic to plants in relatively small concentrations. Lemon seedlings are more sensitive to boron than are oranges. The young growth may be chlorotic when affected with boron.

By use of the continuous supply flow method, the relationship was studied between boron concentration in the culture solution, the effect on tree growth, and the boron concentration in the leaves.

The effect of boron on citrus depends upon the boron concentration and the concentration of ions in the nutritive solution. Increase of boron greatly intensified the tendency to mottle in the Valencia orange trees when grown in soil treated with sodium nitrate. From such a toxic agent as boron, citrus and walnut leaves may become thin, mottled, chlorotic, and crinkled. Ferric sulfate in various amounts tends to overcome the toxicity to lemon seedlings of boron cultures. So-called insoluble borates may be increasingly absorbed and so become toxic. Unless severely and repeatedly defoliated, trees injured by boron may, after leaching with water, recover completely. Citrus and walnut trees affected with boron show reduced calcium and increased potassium, the composition being typical of mottled or immature leaves, and the foliage being prevented from becoming mature as regards ash composition as a consequence of the paralyzing action on the growth processes.

**Cellulose as energy source for free-living, nitrogen-binding microorganisms** [trans. title], P. Tuorila (*Centol Bakt.* [*etc.*], *2. Abt.*, *75* (*1928*), *No. 8–14, pp. 178–182*).—It is claimed that under the experimental conditions described Azotobacter in pure cultures can not utilize cellulose as an energy source for fixing nitrogen, though in mixed cultures with cellulose as an energy source free nitrogen from the air is assimilated by the organisms. These processes may be considerably favored by the addition of small amounts of mannite or glucose.

**The influence of radium on the metabolism of bacteria concerned with nitrogen metabolism in nature** [trans. title], J. Stoklasa and J. Křička (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *74* (*1928*), *No. 8–14, pp. 161–184, fig. 1*).—In 1913 (E. S. R., 30, p. 524), Stoklasa set forth the influence of radium emanations, particularly of α-, β-, and γ-rays, on the vital processes of bacteria which are concerned with the cycle of nitrogen in the laboratory and in the natural economy of certain plants. He has since studied and published (E. S. R., 53, p. 828) facts ascertainable regarding the intensive influence of air and soil radioactivity, and these statements are said to have been confirmed by the work of Kayser and Delaval (E. S. R., 52, p. 22). Such work, as since elaborately developed and herein presented in systematic and tabular form, with discussion, is considered to show that the greatest amounts of carbon dioxide, as also of formic and of acetic acid, are found under the influence of radium emanation, and that under such circumstances the smallest quantities of alcohol can be demonstrated. Quantitative comparisons are made regarding the influences of different emanations.

**Microbiology**, B. F. Lutman (*New York and London: McGraw-Hill Book Co., 1929, pp. X+495, figs. 211*).—Molds, yeasts, and bacteria having many common physiological characteristics are dealt with as a group.

"The general scheme of presentation has been to describe 'types' in considerable detail; a method borrowed from the zoologists. Types have been chosen which are common and have biological or practical importance, if possible, both. As much as possible of both morphology and physiology has been connected to some type of mold, yeast, bacterium, or enzyme, and other facts described in terms of the types. . . . The beginning (general) chapters are the author's solution of textbook work while a class is learning some necessary elementary technic in the laboratory. The final chapters are an attempt to place before both teacher and student some of the theories, problems, difficulties, and controversies that confront the modern microbiologist."

## GENETICS

**Heritable characters of maize, XLI, XLII**, W. H. Eyster (*Jour. Heredity*, *22* (*1931*), *Nos. 7, pp. 224, 225, fig. 1; 8, pp. 250–252, figs. 4*).—Two additional contributions to the series (E. S. R., 65, p. 818) are presented.

XLI. *Dilute aleurone.*—Dilute aleurone color (*da*) in corn appeared to be produced by a genetic factor. Linkage between dilute aleurone and aurea (*au*) was indicated.

XLII. *Reduced endosperm.*—Reduced $\text{endosperm}_1$ kernels are described as very much smaller and usually shorter than normal kernels and often much flattened. Reduced $\text{endosperm}_1$ is inherited as a simple Mendelian recessive character, and its gene $Re_1$ has its locus in chromosome VIII about 15.5 crossover units from $Vp_2$, which inhibits dormancy of the embryo in the seed stage of its development. Kernels showing reduced $\text{endosperm}_2$ are, on the average, smaller than reduced $\text{endosperm}_1$ and are usually less flattened. Reduced endosperm, also is inherited as a simple mendelian recessive, and its gene *$Re_2$* also is in chromosome VIII, very near *$Vp_1$*.

**Radiation-induced variation in cotton,** W. R. HORLACHER and D. T. KILLOUGH (*Jour. Heredity, 22 (1931), No. 8, pp. 253–262, figs. 7*).—Cotton plants grown by the Texas Experiment Station from X-rayed dry cotton seeds included among their numbers numerous dwarfs, and there were plants with branched and fused cotyledons, crumpled leaves, and numerous variegations in leaf color, including sectorial chimeras, central stems missing, and mutations in leaf shape.

**A cytological study of Capsicum annuum,** P. D. DIXIT (*Indian Jour. Agr. Sci., 1 (1931), No. 4, pp. 419–433, pls. 5, fig. 1*).—Studies at the Imperial Institute of Agricultural Research at Pusa revealed 24 diploid chromosomes in *C. annuum*. The general morphology of the root tip cell and the process of somatic mitosis are discussed.

**Investigations of the inheritance of color and markings in Höhenfleck cattle** [trans. title], R. PFÄHLER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 58 (1931), No. 2, pp. 177–221, figs. 7*).—This study was made on Höhenfleck and black-spotted Lowland cattle and showed no relation between the amount of spotting on one side or on the whole animal, shade of color, or sex. By defining three degrees of spotting it was found that the amount of spotting was inherited, but not in any simple manner. The character of the offspring was intermediate between that of the parents. Positive correlations were observed in both the amount and intensity of color between the dams and their daughters.

**A hen with variable plumage color,** C. B. GODBEY and D. H. REID (*Jour. Heredity, 22 (1931), No. 2, pp. 59–62, figs. 3*).—An account is given, from the Texas Agricultural College, of a hen which was a Barred Plymouth Rock, but on molting her feathers were mainly white. Breeding tests showed her genotype to be that of a Barred Plymouth Rock hen. Subsequently she molted and her plumage was that of a typical hen of that breed.

**The effects of selection on eye and foot abnormalities occurring among the descendants of X-rayed mice,** C. C. LITTLE (*Amer. Nat., 65 (1931), No. 699, pp. 370–375, fig. 1*).—By selection from mice showing eye and foot abnormalities induced by X-rays it has been possible to develop strains in which 92.9 per cent exhibit eye abnormalities and other strains in which the percentage showing foot abnormalities has been increased to 88.2 and 85.1 per cent. The percentage of eye abnormalities in these lines was only about 0.6. Progress was also reported in the selection of strains showing high anterior or posterior foot abnormalities. Modifying factors appear to play an important rôle in determining the incidence of anterior and posterior and right and left foot abnormalities.

**A possible explanation of the apparently irregular inheritance of polydactyly in poultry,** J. B. HUTCHINSON (*Amer. Nat., 65 (1931), No. 699, pp. 376–379*).—This is a discussion of the paper by Punnett and Pease (E. S. R., 62, p. 725), in which it is pointed out that the results reported in that paper may be explained on the theory that dominance is controlled by genetic factors.

**Effects of breed on embryo size in the domestic fowl and the rabbit,** T. C. BYERLY (*Science, 74 (1931), No. 1926, pp. 546, 547*).—Continuing the discussion by Castle and Gregory of a previous paper (E. S. R., 65, p. 725), the author found on further study that the blastoderms of the Single Comb White Leghorns and Single Comb Rhode Island Reds did not differ significantly.

**Linkage studies in sheep, B. Wassin** (*Jour. Heredity, 22 (1931), No. 1, pp. 9–13, figs. 3*).—In studies of linkage in sheep at the Central Station for Animal Genetics, Union of Socialistic Soviet Republics, it was concluded that there was no linkage between the dominant factors for additional nipples, presence of wattles, and a white stripe around the neck designated as "necklace." There appeared to be a lack of independent segregation between the factors for dominant white and the nipple and wattle characters.

**A Lamarckian experiment, H. S. Colton** (*Amer. Nat., 65 (1931), No. 699, pp. 343–350, fig. 1*).—The fore limbs of rats were removed at from 4 to 12 days after birth in six generations, and the length of the tibia, fibula, and size of certain muscles compared with unoperated litter mate controls. Although the proportions of the leg bones and muscles changed as a result of the changed manner of locomotion, there was no indication that these changes were hereditary.

**Studies on the inheritance of structural anomalies in the rat, H. D. King** (*Amer. Jour. Anat., 48 (1931), No. 1, pp. 231–260, figs. 3*).—The hereditary basis of several defects in the rat was studied. It appeared that taillessness and anophthalmus were somatic variations and not hereditary. Thyroid and parathyroid deficiencies were probably hereditary, but the mode of inheritance was not determined. Microphthalmus was due to the interaction of several genetic factors which were recessive to the normal in outcrosses. There was a greater tendency for microphthalmic eyes to appear on the right than on the left side of the head in cases where unilateral microphthalmus existed.

**Irradiation of the ovaries of guinea pigs and its effect on the oestrous cycle, I. T. Genther** (*Amer. Jour. Anat., 48 (1931), No. 1, pp. 99–137, figs. 11*).—Exposing the ovaries of female guinea pigs to strong doses of X-rays resulted in general in the degeneration of the developing follicles and subsequent hypertrophy of the theca interna cells of the follicles. The degeneration of the follicles was more pronounced with short exposures to unfiltered X-rays than with long exposures to filtered X-rays. A few follicles matured in such ovaries, usually with atresia occurring before ovulation, but some corpora lutea were formed. Irregular oestrous cycles were observed in such animals.

The general results indicated that the follicular hormone necessary for the initiation of the oestrous cycle is elaborated by the maturing follicles, and that the corpus luteum produces a secretion tending to prevent ovulation.

**The development of the mammary gland as indicated by the initiation and increase in the yield of secretion, C. W. Turner** (*Missouri Sta. Research Bul. 156 (1931), pp. 48, figs. 18*).—The results of a study of the mammary secretions of dairy females from birth through puberty and pregnancy are reported. Secretion prior to puberty appeared to be a rare phenomenon, but secretion began at puberty and increased with the recurring oestrous periods. During pregnancy the amount of secretion remained constant or decreased until about 20 days before parturition, when a very rapid increase was observed.

The development of the mammary gland is correlated with ovarian behavior, but lactation appeared to be initiated by the hormone of the anterior pituitary.

By milking cows prior to parturition normal milk was obtained, and the practice appeared to be beneficial as far as the dam was concerned, but the colostrum was not available for the calf.

Although a heifer spayed before puberty failed to produce any secretion, a spayed heifer in which an ovarian graft was implanted in the neck region produced a maximum of 5.6 lbs. of milk of normal appearance, fat content, and specific gravity.

Considerable data are given on the composition of the mammary secretions and the quantity by quarters during puberty and pregnancy.

**The relation of the anterior pituitary hormones to the development and secretion of the mammary gland, C. W. Turner and W. U. Gardner** (*Missouri Sta. Research Bul. 158 (1931), pp. 57, figs. 24*).—A review is given of the relationship of the hormones of the pituitary gland to the development of the mammary gland and lactation. The results of four experiments are presented in which the effects on the mammary glands of rabbits of the administration of the oestrum-producing hormone from the urine of cows, simultaneous injection of large doses of the oestrum-producing hormone and extracts of corpora lutea, injection of alkaline extracts of the anterior pituitary gland, and injection of extracts of the whole pituitary were studied.

Moderate doses of the oestrum-producing hormone produced no significant changes in the mammary glands of mature rabbits when administered daily for 21 days, but when administered in large amounts with corpus luteum extract a slight secretion of milk was induced. In case pseudopregnancy occurred as a result of the intravenous injections of too small amounts of the gonad-stimulating hormone to be effective when administered subcutaneously, the accompanying development of the mammary glands occurred. The alkaline extract of the anterior pituitary induced lactation in castrated females comparable to that following parturition.

It appeared from this study that the initiation of milk secretion was due to a definite lactation-stimulating hormone present in the pituitary gland.

**A study of the causes of the normal development of the mammary glands of the albino rat, C. W. Turner and A. B. Schultze** (*Missouri Sta. Research Bul. 157 (1931), pp. 45, figs. 63*).—A detailed account is given of the anatomical changes associated with the development of the mammary gland in the normal albino rat through embryonic and postnatal life.

In experimental studies small amounts of the oestrum-producing hormone were found to stimulate growth in the duct system of castrated immature male and female rats similar to the development normally occurring from birth to puberty. Large amounts of the oestrum-producing hormone caused limited lobule proliferation somewhat greater than that characteristic of the mammary gland of the virgin adult female, but not equal to the development in females at advanced pregnancy. A somewhat greater proliferation was induced by the simultaneous injection of corpus luteum extract with five rat units or more of the oestrum-producing hormone, although the administration of the corpus luteum extract alone did not produce significant changes in the mammary gland. In no case was development induced comparable to that in advanced pregnancy. It is suggested that perhaps the reasons for this failure were the improper proportions of the two hormones, or that one or the other was administered in insufficient amounts, or that these two hormones were not all that is required to cause the development of the mammary gland associated with advanced pregnancy.

Implantations of pituitary grafts for short periods or the administration of an extract of sheep's pituitary did not produce significant changes in the mammary gland of castrated females, and were ineffective in initiating milk secretion.

The function of some organ other than the ovary in the development of the mammary gland was indicated by the fact that in adult males marked lobule proliferation was observed.

**The anatomy of the mammary gland of cattle.—II, Fetal development, C. W. Turner** (*Missouri Sta. Research Bul. 160 (1931), pp. 39, figs. 30*).—In continuing this series (E. S. R., 63, p. 626), the development of the mammary structures is described, based on the study of 58 fetuses varying in crown rump length from 26 to 84 cm. Special attention is given to the canalization of the primary sprout forming the streak canal and the cisterns of the teat and gland, the primary milk ducts entering the cistern of the gland, the transition of the mesenchyme tissue as an indication of the mode of formation of the future gland lobules, supernumerary teats, and the union of the glands. The characteristics of the bovine udder at birth are also described in some detail.

It is pointed out that the morphology of the udder of the female develops at a very early stage, while in the male udder development is entirely lacking.

**A case of superfetation in sheep** [trans. title], A. PENTZON (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 21 (1931), No. 2, p. 24*).—A 5-year-old Rambouillet ewe was bred twice, but with 35 days between services. She produced one normal lamb 151 days later, but lactation did not start until a second normal lamb was born 34 days after the first.

## FIELD CROPS

**Modern methods of field experimentation,** C. H. GOULDEN (*Sci. Agr., 11 (1931), No. 10, pp. 681–701*).—Methods of conducting field experiments as developed at the Rothamsted Experimental Station by R. A. Fisher and associates are outlined, with particular attention to methods of calculation. Discussion is accorded general principles, randomized experiments, calculations and formulas for analysis of variance tests, complex experiments, analysis of variance applied to seasonal effects in field experiments, and the shape of field plats.

**The technique of field experiments** (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Confs. No. 13 [1931], pp. 64, figs. 2*).—This report of a conference held at Rothamsted on May 7, 1931, under the chairmanship of A. D. Hall, includes a foreword by E. J. Russell and papers on Principles of Plot Experimentation in Relation to the Statistical Interpretation of the Results, by R. A. Fisher (pp. 11–13); Methods of Field Experimentation and the Statistical Analysis of the Results, by J. Wishart (pp. 13–21); The Technique of Grassland Experiments, by R. G. Stapledon (pp. 22–28); The Technique of Variety Trials, by S. F. Armstrong (pp. 28–36); Multiple Schemes of Field Experiments, by A. H. Lewis, A. D. Manson, and J. Procter (pp. 36–42); The Technique of Horticultural Experiments, by T. N. Hoblyn (pp. 42–49); Practical Details of Experimentation on Ordinary Commercial Farms, by H. V. Garner (pp. 49–53); Methods of Estimation of Crop Growth and Yield, by D. J. Watson (pp. 54–60); and The Importance of Field Experiments, by T. H. J. Carroll (pp. 60–63).

**Wyoming forage plants and their chemical composition.—Studies No. 9,** O. C. MCCREARY (*Wyoming Sta. Bul. 184 (1931), pp. 23, fig. 1*).—Continued studies (E. S. R., 58, p. 530) on the food value of forage plants dealt with seasonal changes in herbage, largely of grasses and used for summer and winter pasture, and in evergreen plants, bushy in nature and used for winter pasture; the effects of close grazing; and the composition of forage plants from the Red Desert and from Teton County and Yellowstone Park. Some of the observations have been reviewed earlier (E. S. R., 63, p. 130).

In ungrazed pasture grass the percentage of crude protein was found highest in the spring at the start of growth in April or May, but after the first few weeks of growth to decrease gradually until fall, reaching the minimum when all leaves and stems were dead. This decrease as the season progressed was noted in both nonprotein and albuminoid nitrogen. In pasture grass cut closely the percentage of crude protein fell and rose with a decrease or increase of rainfall. Contrariwise, the percentage of crude fiber increased with the advance of season and decreased with the increase of rainfall. The percentage of phosphorus varied directly with the crude protein.

Cutting tests indicated that by close grazing a larger quantity of protein and less fiber is obtained than by infrequent grazing or no grazing; hence the most food is to be obtained from a pasture by close grazing.

Common sage (*Artemisia tridentata*). salt sage (*Atriplex nuttallii*), and shadscale (*A. confertifolia*) showed an increase of sugar starting in summer and reaching a maximum in late winter and spring, nonreducing sugars having the highest percentage in January and reducing sugars in April. The crude protein, crude fiber, and ether extract in these plants were practically constant during autumn and winter.

**[Crops experiments in Montana]** (*Montana Sta. Rpt. 1930, pp. 18, 19*).—Fallowing dry land, as a rule, produced more nitrates in the soil and produced wheat having a much higher protein content than that grown on land cropped continuously. All proteins did not appear to have equal value in determining the quality of wheat. In the late dough stage of wheat a light frost did not injure its worth for producing a flour of high quality.

Analyses of fodders in districts where bone chewing by cattle was observed revealed a decided lack of phosphorus in the soil. Application of a phosphate fertilizer to meadows resulted in increased yields and percentages of phosphorus in the crops. Phosphorus applications markedly increased yields of sugar beets and alfalfa in certain areas and also benefited corn, wheat, and potatoes.

**[Agronomic work in Northumberland County, England]** (*Northumb. Co. Ed. Com. Buls. 43 (1930), pp. 4–6, 9–56, pl. 1; 44 (1931), pp. 4–6, 9–56, pl. 1*).—Experiments with field crops at the county experiment station at Cockle Park reported on for 1929 and 1930 and for various periods were along the same general lines as noted heretofore. (E. S. R., 63, p. 224). The work for 1930 was reported by J. A. Hanley.

**Phytotechnology and genetics** [trans. title], V. Boret (*Min. Agr. [France], Rap. Fonct. Inst. Recherches Agron., 1927, pp. 161–184; 1928, pp. 254–274; 1929, pp. 296–352; 1930, pp. 351–410*).—Crop improvement studies in 1927, 1928, 1929, and 1930, carried on at experimental stations in different sections of France in cooperation with the Institute of Agronomic Research, included breeding work with wheat, rye, oats, barley, potatoes, flax, and horse beans; baking tests with wheat varieties and selections; and trials of varieties of stock beets and miscellaneous legumes.

**[Agronomic experiments in Guam]**, C. W. Edwards and J. Guerrero (*Guam Sta. Rpt. 1930, pp. 1, 2, 9–13, 15, 16, figs. 11*).—Variety tests with cowpeas, legume cover crops, lawngrasses, sweetpotatoes, and yams, and cultural and adaptation trials with forage grasses are reported on again (E. S. R., 64, p. 823). Trellised yams again decidedly outyielded those not provided with supports.

Of different varieties of coarse forages, Napier and Guatemala grasses were found well adapted to nearly all the local fertile soils, whereas Japanese cane was not suited to upland districts of northern Guam. Japanese lawngrass surpassed either centipede or Bermuda grass for lawns on an upland cascajo soil, especially during the dry season. The fiber plants henequen, sisal, and maguey grew well on a rocky limestone hillside. The legumes best for improving the soil, suppressing weed growth, and preventing soil erosion included *Tephrosia* spp., kalomu (*Calopogonium mucunoides*), Black Mauritius velvetbean, and seguidillas.

**Sisal and other agave fibers,** F. TOBLER (*Sisal und Andere Agavefasern. Berlin-Charlottenburg: Walter Bangert, 1931, pp. VII+104, figs. 44*).—Practical information is presented on the agaves as fiber plants, characteristics of the fiber, cultural and field methods and harvest practices used in different producing regions, and extraction, spinning, and utilization of the fiber. The bibliography lists 45 titles.

**Alfalfa,** O. E HEUSER (*Die Luzerne. Berlin: Paul Parey, 1931, pp. VIII+228, figs. 70*).—The information assembled in this monograph in successive chapters is concerned with the value of alfalfa as a forage crop, its origin and migration, species, species hybrids and types, producing regions, structure and growth of the plant, climate and soils, production practices, harvesting and utilization, seed growing and breeding, varieties and seed sources, diseases, insect pests, and weeds.

**Corn silage production,** J. E. METZGER and R. L. SELLMAN (*Maryland Sta. Bul. 329 (1931), pp. 12*).—Variety tests with corn for silage on Leonardtown silt loam from 1918 to 1929 showed Cocke Prolific, Eureka, and other smooth- and shallow-dented corns to lead in total tonnage in good and average seasons. Costs per acre of producing silage over the period 1925 to 1930, based on average acre yield of 12.87 tons, averaged $33.87, of which manure, lime, and fertilizer cost $11.72, land preparation $3.93, seed and planting 98 cts., cultivation $3.22, and harvesting and storing $14.04, or an average cost of $2.92 per ton.

Among a number of silage supplements, rye planted from September 15 to October 15 made a higher tonnage of green material with a lower moisture content than did later plantings. Wheat appeared to be a better companion crop than rye for vetch as a pasture supplement. A 5-year dairy rotation of silage corn, winter barley, and alfalfa (3 years) is outlined.

**Progress report on mechanical application of fertilizers to cotton in South Carolina, 1930,** G. A. CUMINGS, A. L. MEHRING, G. H. SERVISS, and W. H. SACHS (*U. S. Dept. Agr. Circ. 192 (1931), pp. 32, figs. 8*).—Methods of applying fertilizer to cotton were studied as a continuation of experiments on other phases of the problem (E. S. R., 63, p. 482) and under similar cooperation. While placement of fertilizer in relation to the seed received major attention, the effects of irregular distribution, size of fertilizer particles, concentration of the fertilizer, and split applications were also considered. The experiments were conducted in South Carolina at the Pee Dee Substation on Ruston fine sandy loam, at the Sandhills Substation on Norfolk coarse sand, and at Clemson College on Cecil sandy clay loam.

All methods of application used, with the exception of the fertilizer in immediate contact with the seed, resulted in satisfactory stands of cotton under the favorable moisture conditions prevailing at germination on Cecil sandy clay loam. On Ruston fine sandy loam, with unfavorable moisture conditions, fertilizer applied 3 in. or less below the seed injured germination considerably, being more severe at shallower depths and very harmful where in contact with the seed. The appearance of plants above ground was delayed where the fertilizer was placed 4 in. below the seed. With all placements at the sides of the seed, plants emerged as rapidly and in as large numbers as on unfertilized rows. The effects of fertilizer placement on germination on Norfolk coarse sand with rather favorable moisture conditions resembled those on the Ruston fine sandy loam. Stands on Cecil sandy clay loam were not affected appreciably by increases in the rate of a high-analysis fertilizer from 200 to 400 or 600 lbs. per acre, whereas such increase was attended by injury to stands on the other two soils where fertilizer was applied in a 1.75-in. band 2 in. below the seed and where mixed with the soil but not where the fertilizer was applied at the sides of the seeds.

The highest yields were obtained with the fertilizer placed closest to the seed when injury to germination was not serious. The optimum distance between seed and fertilizer may depend upon such factors as the soil, its moisture content, and climatic conditions. On the lighter textured soils fertilizer applied in bands on each side of the seed gave best yields, while applications in narrow bands below the seed were best on the sandy clay loam. On the latter soil mixing the fertilizer with the soil did not increase the yield of seed cotton. Where fertilizer was applied below the seed, currently a common practice, beneficial results seemed to follow from using part of the fertilizer at planting and the remainder as a side dressing after chopping where large quantities were used on the light-textured soils. The irregular distribution of fertilizer resulted in lower yields of seed cotton. Size of fertilizer particles appeared to be a factor in the efficiency of the fertilizer. Localization of the superphosphate through the use of granular material was indicated as desirable.

**Yield studies in oats,** [II]–IV (*Ann. Appl. Biol., 13 (1926), No. 4, pp. 535–559, figs. 5; 18 (1931), Nos. 1, pp. 37–53, figs. 7; 2, pp. 187–202, figs. 3*).—Three additional papers of this series (E. S. R., 57, p. 430) are presented.

[II]. *The effect of the pre-treatment of the parent crop upon the seed produced, its germination, and subsequent growth.* M. G. Jones and M. A. H. Tincker.—The germination and growth rate at the Welsh Plant Breeding Station of Record oats from seed produced under different environmental conditions showed that both time of planting and environmental conditions affected the mean weight of the seed produced. Maturity was largely eliminated as a factor, being closely related to meteorological conditions prevailing just before and during harvest. The relative proportions of single kerneled spikelets, the size of the kernel, and especially the number of spikelets per panicle, were among panicle characters that seemed most readily influenced by seasonal and agronomic conditions. The usual germination tests gave satisfactory indications of field stands. Grading the seed samples increased the number of heavy kernels and of plants established during the first two weeks but did not make the yields of all lots equal, suggesting that other factors are operative in this respect. Heat seemed to be a suitable method to gain further information as to the seed's vigor. Little indication of the plant's capabilities was discernible in seedling behavior.

III. *The inter-relationship of the parts of the oat plant during development,* M. A. H. Tincker and M. G. Jones.—The side tillers and main axis of spaced oats plants were removed at successive stages of development and the after-effects observed upon the growth rate of roots and shoots. Removal of lateral branches in developmental stages, during which they depended upon the parent branch, resulted in an accelerated rate of growth of the parent axis. Removal of any part of this growth, actively engaged in photosynthesis, depressed the growth rate of the plant as a whole. Such changes were reflected in the root system and the ratio of root to shoot. The observations had a close relation to earlier studies (E. S. R., 49, p. 827) on the relative yield of grain and straw obtained from a variety. In late multitillered varieties, i. e. the heavy straw yielders, the relationship of plant parts more closely corresponded to that observed under wide than under close spacing, whereas early varieties in general behavior resembled more nearly plants spaced closely or grown at wide intervals with tillers removed.

IV. *The influence of climatic factors upon the growth of a spring sown variety "Record,"* M. A. H. Tincker and M. G. Jones.—Oats plants were taken at weekly intervals and the leaf area measured and the dry weight of the top growth recorded. The unit leaf rate (of Briggs, Kidd, and West, E. S. R., 45, p. 525) was found to be correlated with the previous rainfall and also with the temperature during the period of growth in which the plants form new leaves and increase their leaf area. The relative rate at which the leaf area increased was correlated also with the previous rainfall; high rainfall insures leaf development. The rate at which the area increases was correlated negatively with temperature under field conditions. When the relative rate of increase of the dry weight of the tops served as the growth index it was not possible to trace out significant relationships with meteorological data.

**Sources of Irish Cobbler seed potatoes,** J. Bushnell (*Ohio Sta. Bimo. Bul. 153 (1931), pp. 223–228, fig. 1*).—Comparative tests during 1929, 1930, and 1931 of certified Irish Cobbler seed potatoes from several sources showed all lots practically free from disease and giving excellent stands. The highest yielders in each test were from Michigan or New York. The apearance of a sample of seed potatoes was not an index to its capacity to produce high yields. Total yields of home-grown seed in two tests at Marietta about equaled those of certified samples, although they included a larger proportion of small tubers. It was suggested that spring-crop Irish Cobblers might be suitable for seed if special attention were given to storage.

**Production of early potatoes in Germany,** P. Friebe (*Der Deutsche Frühkartoffelbau und Seine Anbautechnik. Berlin: Paul Parey, 1931, pp. 100, figs. 38*).—This book discusses the economic bases, the current status, and production practices and problems of the growing of early potatoes in Germany.

**Potato storage in the Central Provinces,** J. F. Dastur (*Agr. and Livestock in India, 1 (1931), No. 4, pp. 374–381, pls. 2*).—The results of experiments on the storage of potatoes under conditions existing in the Central Provinces of India are reported. It was shown that during the monsoon months potatoes can be preserved as seed better in a less humid place than in a moist one. During the summer months potatoes can be preserved underground at a very small cost and without any appreciable loss.

**Variety tests of sugarcanes in Louisiana during the crop year 1929–30,** G. Arceneaux, I. E. Stokes, and R. B. Bisland (*U. S. Dept. Agr. Circ. 187 (1931), pp. 24*).—Results of sugarcane variety tests in Louisiana in the crop year 1929–30 were in remarkably close agreement with those in previous years (E. S. R., 65, p. 132). The seasonal conditions, methods, field results, and mill tests are described, the data for the year and for the period 1926–1930 are summarized, and the origin and characteristics of C. P. 807 and Co. 281 are outlined.

Of the mosaic-tolerant varieties P. O. J. 36, P. O. J. 36–M, P. O. J. 213, and P. O. J. 234, now in general cultivation, P. O. J. 213, generally established as the standard variety, is outstanding for its record of satisfactory comparative performance in good and in bad years. It is, however, subject to severe lodging, and its apparent susceptibility to injury from red rot may seriously impair its future usefulness. P. O. J. 36 consistently produced cane lower in yield and quality than P. O. J. 213, disadvantages appearing to more than offset its larger barrel and greater resistance to lodging. P. O. J. 36–M is distinctly preferable to P. O. J. 36. The quality of its cane was generally comparable to that of P. O. J. 213, although yields were generally lower, a disadvantage partly compensated for by superior field handling qualities resulting from its larger barrel and comparatively erect growth. P. O. J. 234 consistently produced an unusually high quality of cane which justified its continued cultivation in spite of rather poor stubbling qualities and comparatively low yields of cane.

C. P. 807 during the three years grown in comparative plantation tests consistently indicated a remarkably high acre production of cane and sugar and afforded cane usually comparable with P. O. J. 213 in juice analyses. Its higher fiber content may necessitate certain mill adjustments and changes, and because of its recumbent habit of growth it is more difficult to harvest and transport than varieties with a more erect growth habit. It also was characterized by extreme vigor, high yields on poorly drained heavy soils, resistance to red rot in the field, and tolerance to cold. Co. 281 produced cane of higher sugar content than that of P. O. J. 213, and in stubbling qualities, especially when harvested early in the season, appeared to be distinctly superior to P. O. J. 234.

**Experiments in curing Sudan grass hay,** H. C. RATHER and R. H. MORRISH (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 101–103*).—Cut August 10, 1931, during cool and slightly cloudy weather with practically no precipitation, Sudan grass hay was cured by eight different methods. When quality of hay, time of curing, and economy of harvest were considered the results favored curing the hay one or two days in the swath and then raking it with a side delivery rake into a two-swath windrow, where, unless rain interferes, curing is completed without further attention.

**Factors which influence spontaneous self-fertilization in sweet clover (Melilotus),** L. E. KIRK and T. M. STEVENSON (*Canad. Jour. Research, 5 (1931), No. 3, pp. 313–326, pl. 1, fig. 1*).—Factors described as seeming to influence the tendency of sweetclover to produce seed by spontaneous self-fertilization include length of stamens, stage of flower development when pollen is liberated, distribution of free pollen within the flower, size of cavity in the upper part of the keel, quantity of pollen, condition of pollen, and receptivity of the stigma. Although the normal condition in certain plants of white sweetclover (*M. alba*), spontaneous self-fertilization was not found to occur in any yellow sweetclover except Redfield Yellow. True breeding lines of *M. alba* isolated consisted of natural self-fertilized plants, and other lines isolated did not produce seed unless the flowers were manipulated. *M. alba* consists of a mixture of normal self-fertilized plants and plants random pollinated, especially in certain varieties, as Arctic. The character of spontaneous self-fertilization showed clear-cut segregation in a selfed line of *M. alba*. The efficiency of the suction method of emasculating sweetclover flowers (E. S. R., 62, p. 513) appeared to depend on their peculiarities.

**A method of describing wheat glumes,** R. KILGAN (*Sci. Agr., 11 (1931), No. 10, pp. 702, 703, fig. 1*).—A diagram drawn each year shows the average measurements of 50 glumes selected annually, 1 from each of 50 heads of the wheat variety under study. Averages of data for any period of years can be shown likewise. Comparison of the diagrams from annual data with that from average data for a period permits the observer to study the influence seasonal conditions may exert quantitatively on glume characters.

**The source and nature of variability in a strain of Marquis wheat,** J. B. HARRINGTON (*Sci. Agr., 11 (1930), No. 1, pp. 44–55, figs. 2*).—In 1925, 1,220 single plants of the nonuniform strain of Marquis No. 7 (E. S. R., 58, p. 136), harvested at random at the University of Saskatchewan, were classified as type C typical Marquis, B differing distinctly from Marquis in spike and spikelet characters, and type A plants more or less intermediate morphologically between C and B or differing widely from these in one or more characters.

Various progeny tests and a cross between C and B indicated that natural crossing was responsible for most if not all of type A plants. The likelihood of natural crossing makes it inadvisable to grow different wheats in close proximity. The proper time for the removal of an off type plant appeared to be between heading and flowering, for the damage from natural crossing occurs during the flowering period. Environmental effects appeared to obscure easily small genetical similarities and differences. Beak shape was indicated as the best character for the recognition of intermediacy in a given plant, and glume shape was nearly as good, whereas spike shape and spike density were worth little.

**A comparison of commercial wheat varieties in Michigan over-State tests,** H. C. Rather and G. F. Wenner (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 103–105*).—Tests during two years with leading commercial wheat varieties from Michigan, Ohio, and Indiana, including Nabob, Fulhio, Trumbull, Red Rock, Michigan Amber, Bald Rock, Fultz, Gladden, and Berkeley Rock, all soft red winter, and American Banner, a soft white winter wheat, indicated that these varieties are similar in yield when seasonal conditions are favorable.

**Study of the weeds of alfalfa fields of Iowa,** A. L. Hershey and L. H. Pammel (*Iowa Acad. Sci. Proc., 37 (1930), pp. 77–85*).—Readings taken in 15 alfalfa fields in 13 counties in Iowa in 1928 and 1929 showed the predominating weeds before the first cutting (in June) to be common and yellow foxtails, sour dock, and in some fields squirrel-tail grass, quack grass, bluegrass, and occasionally goat's beard; just before second cutting (in July or early August) foxtails, barnyard grass, small ragweed, bluegrass, heartsease, smartweed, quack grass, and occasionally goat's beard; and just before the third cutting small ragweed, foxtails, barnyard grass, heartsease, and sour dock.

**Some weeds of Iowa, Florida, lower Rio Grande Valley, Cuba, and India compared,** L. H. Pammel (*Iowa Acad. Sci. Proc., 37 (1930), pp. 143–149*).—This contribution from the Iowa State College lists important weeds in the regions indicated above and discusses weed migration, especially as to *Lactuca scariola, Solanum carolinense, Bidens involucrata, B. leucantha, Convolvulus arvensis*, and several grasses.

## HORTICULTURE

**After-ripening, germination, and storage of certain rosaceous seeds,** W. Crocker and L. V. Barton (*Contrib. Boyce Thompson Inst., 3 (1931), No. 3, pp. 385–404, figs. 2*).—At the Boyce Thompson Institute it was found that apple seeds which had been held in dry, warm storage for 2.5 years germinated quite well when properly afterripened at low temperatures in moist granulated peat (pH 4) or in neutral granulated peat, suggesting the possibility of keeping apple seed for some time. Germination was, however, less than with 6-months seeds. Constant temperatures of 1° and 5° C. maintained for 3.5 months or a fluctuating temperature between 5 and 10° gave good results, while 10° constant was apparently too high. One month of afterripening, irrespective of temperature, was not enough for best results. Apple seeds taken from pomace gave poorer and slower germination than seeds taken directly from fruits. Seeds were afterripened in cold storage apples.

For peach seeds 1° was apparently a little too low and 10° not too high. The removal of the pericarp increased the germination of peach seeds. Other species studied include *Pyrus arbutifolia, P. arbutifolia atropurpurea, Amelanchier canadensis*, and nine species of Rosa. A constant afterripening temperature of 5° was very satisfactory for roses. Both green and ripe seeds of *R. rugosa* showed better germination after three years of dry storage than when fresh. *R. multiflora*, on the other hand, gave 48.4 per cent germination after three years and 72.5 per cent when fresh. *R. setigera* gave 53.4 per cent fresh germination and 35.6 per cent after two years of dry storage.

**Experiments in nursery propagation,** V. T. Stoutemyer (*Iowa State Hort. Soc. Rpt., 65 (1930), pp. 268–270*).—In experiments at the Iowa Experiment Station the use of bottom heat in outdoor frames in midsummer gave marked increases in the rooting of Prunus, the Eva Ratheke weigela, Aronia, the red leaved Japanese barberry, Hydrangea, and some other forms. Evergreen cuttings planted about July 1 did not root without bottom heat. Peat gave excellent results but differed in value according to its pH rating and source. The treatment of cuttings by placing the cut ends in a weak solution of sugar gave promising results with French lilacs and *Viburnum carlesii*, especially if they were subsequently placed in a peat mixture for rooting. The removal of the terminal bud of cuttings gave unfavorable results with Althea, Cornus, Diervilla, Cercis, and certain Spireas.

**Some new ideas for the nurseryman and planter,** J. A. Neilson (*Iowa State Hort. Soc. Rpt., 65 (1930), pp. 271–275*).—The waxing of cuttings and young nursery stock is described and discussed. Most species, according to the author, will withstand a temperature of from 170 to 180° F. if dipped quickly. Below 160° the wax forms a thick coating liable to flake off.

**Old and new standpoints on senile degeneration,** A. P. C. Bijhouwer (*Jour. Pomol. and Hort. Sci., 9 (1931), No. 2, pp. 122–144, pl. 1, figs. 2*).—A general survey and discussion is presented upon the old age or senility theory in plants, the author reaching the conclusion that clons do not perish because of age alone, and that if degeneration does occur it is the result of disease or of faulty or adverse methods of culture.

**[Horticulture at the Guam Station],** C. W. Edwards and J. Guerrero (*Guam Sta. Rpt. 1930, pp. 2, 3, 12, 14, 17, 18, 20–23, figs. 4*).—In attempts to control gummosis and scaly bark of citrus benefit was derived from scraping the affected portions and disinfecting the wounds with bichloride of mercury in alcohol and applying a Bordeaux mixture paste.

As a result of trial shipments to Manila, it was found that sound avocado fruits if carefully handled and held at 40° F. could be kept for 16 days.

The yellowing of pineapple plants growing in calcareous soils was traced to a deficiency in available iron in the soil, and was overcome by spraying the plants with a 6 per cent solution of iron sulfate once a week for 5 consecutive weeks. At the same time spraying with ammonium sulfate had no benefit. Studies in propagation of avocados and mangoes indicated the desirability of using the modified side graft, especially for mangoes propagated during the rainy season. The results of variety tests with beans, cabbages, and tomatoes are briefly summarized and notes presented on the distribution of seeds and plants.

**The farm garden,** J. H. and W. R. Beattie (*U. S. Dept. Agr., Farmers Bul. 1673 (1931), pp. [2]+68, figs. 26*).—This publication, superseding Farmers' Bulletins 934 and 937 (E. S. R., 39, p. 139), presents general information on the planning, planting, and care of gardens, with specific information relating to the culture of different types of crops.

**The effect of temperature on vegetable growing,** E. S. Haber (*Iowa State Hort. Soc. Rpt., 65 (1930), pp. 387–393*).—Soil and air temperature records taken by the Iowa Experiment Station during the hot, dry summer of 1930 at Ames and at Muscatine led to the conclusion that although much of the damage during droughts may be traced to moisture shortage, heat in itself is deleterious. Carrots sown in soil that was watered immediately following seeding burned off at the ground surface. Sweet corn that was watered failed to fill out its kernels. The tomato, on the other hand, suffered chiefly from a lack of water. Paper mulch and straw mulch proved of no benefit to tomatoes in 1930, being actually harmful during the hot weather, apparently by holding the soil temperature at too high a point. The soil warmed up faster than it cooled.

**Celery fertilizer experiments in Ohio,** D. Comin (*Ohio Sta. Bul. 493 (1931), pp. 17, figs. 2*).—Fertilizer experiments conducted with celery on a muck soil located in Portage County showed the value of rather heavy applications of complete materials, despite the fact that the unfertilized plats produced nearly 30,000 lbs. of untrimmed celery per acre the second year after clearing. Manure gave substantial yield increases when supplementing the basic treatment of 1,000 lbs. of 2–8–16 fertilizer, but since the chemicals in manure produced 40 per cent more celery when applied in commercial form, the use of manure is not recommended when cover crops are grown and when manure costs more than $2 per ton applied. A ton per acre of 2–8–16 fertilizer, the largest amount used, gave substantial increases in yield above the 1,500-lb. treatment. The results with lime did not justify its use, except in conjunction with sulfate of ammonia, this combination giving somewhat better and more consistent results than did nitrate of soda.

Doubling the phosphorus in the basic treatment increased yields each year, a maximum increase of 165 per cent being obtained in 1928. Doubling the potash in the basic treatment increased yields by 8.6 per cent. Common salt proved detrimental. In the presence of phosphorus and potash, as applied in the basic treatment, the lack of ample nitrogen is deemed the limiting factor in celery nutrition on the soil under test, and the author recommends that not less than 65 lbs. of nitrogen be applied per acre as a top-dressing where no less than 20 lbs. are included in the basic treatment. In rainy seasons top-dressings of nitrogen should be applied at intervals rather than in one early application.

**History of the Honey Rock melon,** C. H. Mahoney (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 81–84, figs. 2*).—The origin and characteristics of a new variety of melon are discussed, with the comment that the variety still lacks uniformity, homozygosity never having been obtained, although the station has made substantial progress in that direction.

**Chemical investigations relating to potassium deficiency of fruit trees,** T. Wallace (*Jour. Pomol. and Hort. Sci., 9 (1931), No. 2, pp. 111–121*).—Deficiency of potassium in the soil was found reflected by a deficiency of the same element in the leaves, shoots, main stem, and fruit pulp, but not in the pits of plums. The percentage of dry matter in fresh tissues was usually increased and the ash content and potash content of the ash and dry matter greatly decreased in the presence of deficient potassium. Differences in susceptibility to leaf scorch were accompanied by corresponding differences in potassium content, but the chemical differences were too small to suggest that potassium deficiency can be overcome entirely by the use of resistant varieties. In cases where negligible responses were obtained from potassium it was found that the plants had failed to take in adequate amounts of potassium from the fertilizer applied.

**The elimination of sources of error in field experiments: The standardization of fruit tree stocks,** R. G. Hatton (*East Malling [Kent] Research Sta. Ann. Rpt., 16–18 (1928–1930), pt. 2, pp. 13–21*).—Lane Prince Albert apple trees on stocks IX, II, I, and XII at 10 years of age made total growths of 136.6 ± 9.6, 388.5 ± 26.1, 548.2 ± 25.3, and 810.4 ± 27.1 meters and total yields of 72.7 ± 5.2, 56.5 ± 3.4, 75.1 ± 3.8, and 22.7 ± 1.7 lbs., respectively. In another test Early Victoria apples on seedling French Crab roots and on Paradise were compared as to yield and found much more variable on the Crab roots. The highest tree on Crab outyielded the lowest by 10 times, whereas the ratio on Paradise was only 4. The coefficients of variability for yields were 57.1 and 36.5 per cent and for girths 27.4 and 12.9 per cent, respectively.

Measurements of girth of manured and nonmanured Bramley Seedling trees on four clonal stocks showed certain rootstocks to be much less sensitive to manure than others. Data on the yield of Worcester Pearmain and Bramley on four clonal rootstocks showed similar differences in response to manure.

**Correlation studies of the growth of apple and cherry trees in the nursery from the seedling to the two-year budded tree,** H. B. Tukey and K. D. Brase (*New York State Sta. Tech. Bul. 185 (1931), pp. 31, figs. 4*).—A statistical analysis of records taken on French crab and Mazzard cherry seedlings and on the growth of McIntosh apple and Montmorency cherry budded on such stocks showed strong correlations between after-budding size and the size of the 1- and 2-year-old trees and between 1-year and 2-year tree size. Correlations between planting size and after-budding size, between planting size and the size of 1-year whips, and between planting size and the size of the 2-year tree were, on the other hand, insignificant or approximately so. Correlations were higher for the same characters with cherries than with apples, a situation believed associated with a higher percentage of good trees in the cherry, apparently as a result of greater losses from imperfect unions.

Interpreting the results, the authors suggest that the importance of the bud union in the production of a large nursery tree is of lesser magnitude than the development in size of the understock during its first season in the nursery. Under the conditions of the test, genetic differences between the seedlings were apparently masked by environmental factors, such as pruning, planting, culture, soil drainage, and general climatic conditions.

**Bridge-graft and save trunk-injured fruit trees,** R. L. McMunn (*Illinois Sta. Circ. 381 (1931), pp. 20, figs. 13*).—Bridge grafting is discussed with respect to the type of trunk and root injury requiring such treatment, the actual practices of the operation, and the control of rodents to prevent injuries.

**The advantages of disbudding as a method of heading apple trees,** W. A. Ruth (*Iowa State Hort. Soc. Rpt., 65 (1930), pp. 143–150*).—This is a discussion of the practice of disbudding as a means of developing the head of young fruit trees.

**Apple pollen may be wind-borne,** J. F. Hockey and K. A. Harrison (*Iowa State Hort. Soc. Rpt., 65 (1930), pp. 248–250*).—In a study of the Dominion Experimental Farm, Kentville, N. S., slides placed at distances of from 10 to 135 ft., from apple trees for the purpose of collecting apple scab spores all collected pollen grains, most abundantly near the trees but to some extent at all the distances covered. The bearing of the results on the possibilities of wind as a factor in pollination is discussed.

**Peach stock trials: A progress report,** A. W. Witt and R. J. Garner (*East Malling [Kent] Research Sta. Ann. Rpt., 16–18 (1928–1930), pt. 2, pp. 22–31, pls. 2*).—Trials of Hale Early peach on a wide range of rootstocks showed certain stocks in common use for plums and some seedlings of Damas and Julien to be totally incompatible with peaches. In some cases incompatibility was manifested in death following planting. Clear differences between the lots were shown in the field tests and to a lesser extent in pot trials in the greenhouse. Brompton and Common Mussel stocks yielded outstandingly vigorous trees, while Pershore and Kroosjespruim were dwarfing in effect. Brompton-rooted trees were most productive in the greenhouse, and those on Kroosjespruim were unproductive.

**Development of new fruits for the Northwest,** W. H. Alderman (*Iowa State Hort. Soc. Rpt., 65 (1930), pp. 85–91*).—A comprehensive discussion is presented of the fruit breeding activities of the Minnesota Experiment Station with regard to the purposes, work in progress, and results accomplished.

**European blackberry seedlings and hybrids in the Pacific Northwest,** G. M. Darrow (*Jour. Heredity, 22 (1931), No. 5, pp. 143–146, figs. 2*).—Observations on thousands of plants originally derived from the Evergreen and Himalaya varieties of European blackberry showed but little deviation from the parental types, apogamic reproduction being obviously preponderant. A certain number of variant forms were brought together for study as to possibility of natural crossing.

**Inheritance of sex, colour, and hairiness in the raspberry, Rubus idaeus L.**, M. B. CRANE and W. J. C. LAWRENCE (*Jour. Genetics, 24 (1931), No. 2, pp. 243–255, pls. 2, figs. 2*).—In addition to the hermaphroditic form distinguishing all cultivated raspberry varieties, there were observed in studies at the John Innes Horticultural Institution male, female, and neuter types. The males had obtuse, downfolded, and undivided leaves on the fruiting canes and three-lobed, short-petioled leaves on the new canes. The obtuse character of the males was also evidenced by the rounded flower buds. It is conjectured that the heterozygous sex condition is correlated with convex and curled foliage.

In crosses between the several forms a close approximation to the expected Mendelian segregation was observed. Color of spines was found correlated with fruit color, the red and red-tinged spines with red fruit and green-spined forms with yellow fruit. Hairiness proved dominant to the subglabrous condition.

A high degree of self-sterility was recorded. From 10 fruits of Pyne Royal selfed there were secured 61 plants and from 10 fruits of Lloyd George selfed 96 plants, whereas Lloyd George × Pyne Royal yielded progeny at the rate of 44 plants per fruit. In selfing, lethal factors in the homozygous condition are believed to eliminate many of the zygotes. Cytological studies by C. D. Darlington of several of the varieties showed all to be diploids, there being no difference between hermaphrodites and males in this respect.

**Pruning and thinning experiments with grapes**, A. J. WINKLER (*California Sta. Bul. 519 (1931), pp. 56, figs. 14*).—Records taken on the weight of leaves produced by Muscat of Alexandria and Alicante Bouschet vines handled in four ways, (1) no pruning, part crop removed, (2) cane pruned, part crop, (3) normal pruning, all crop retained, and (4) severe pruning, all crop, showed that the smaller the amount of wood removed the more rapidly the leaves developed and the greater was the total foliage. The relative weight of vine varied inversely with the severity of the pruning. Observations on the effect of crop on growth showed a regular falling off in the weight of vine as the crop increased.

Vines not pruned at all and allowed to carry a full crop were the most productive over a 4-year period. Pruning retarded the development of both male and female flower parts, more especially the former, as was indicated in 55 per cent pollen germination for no pruning, part crop vines, and 10 per cent for severe pruning, all crop vines. Furthermore, the clusters on the lightly pruned vines had an increased percentage of normal berries. The removal of a portion of the clusters before blooming resulted in the development of very large clusters.

A method of treatment consisting of moderate pruning and flower cluster thinning to regulate the crop is deemed of promise for improving the fruiting of various table grapes in which appearance is an important consideration.

The Muscat of Alexandria variety, typical of those which are subject to shelling or shot berry, or both, when normally pruned, responded favorably to cane pruning, cluster thinning, and the pinching off of the apical third of the cluster. The pollen of normally pruned Muscat of Alexandria vines was 12 per cent viable as compared with 42 per cent for pollen of cane pruned and cluster thinned plants. Of all varieties Hunisa showed the greatest improvement in fruiting as a result of longer pruning, the sugar content of the fruit juice of cane pruned vines being 21° Balling as compared with 19° for normally pruned vines. The results of studies with other varieties, including Malaga, Emperor, Ohanez, and Tokay, are discussed. The set of fruit in Malaga and Tokay approached perfection with short pruning, and for these varieties only slight lengthening of growth is advised, simply to permit the removal of undesirable clusters without lessening the crop. In certain varieties, such as Thompson Seedless, which forms very large clusters, uneven ripening in the cluster was overcome by leaving somewhat longer canes and removing the excessively large clusters altogether, or by removing the apical ends of clusters or cluster parts. The practical phases of pruning and cluster thinning are discussed.

**The propagation of citrus by cuttings,** F. F. HALMA (*Hilgardia* [*California Sta.*], *6* (*1931*), *No. 5, pp. 131–157, figs. 13*).—Stating that citrus is generally propagated by budding, the author discusses certain forms of cuttage that may have value in the multiplication of stocks or in the propagation of material for experimental purposes.

The importance of leaves on cuttings was observed in the case of the Eureka lemon, where no rooting occurred without leaves and excellent results were secured where leaves were left. The position of the cut was not important, but the nature of the cut was a factor, the greater the slope the fewer the roots. The percentage of rooting in any given variety was notably influenced by the condition of the parent tree, the more vigorous trees yielding the better results.

No indication was found in the nursery that trees from cuttings were inferior to budded trees. Measurements of height of cuttings and of seedling orange trees failed to show any significant differences in variability, a fact believed due to the apogamic reproduction in the orange. Grafts of various rootstock and scion materials rooted readily and compared favorably with budded plants. The rootstock of a mature citrus tree was readily increased by grafting twigs with leaves onto root pieces.

Observations on leaf cuttings showed a high positive correlation between both area of the leaf and green weight of the leaf and rooting performance. It was not determined whether root activity is initiated by foods stored in the leaf or by the immediate availability of photosynthetic products made by the leaf. The amount of roots produced per unit of fresh weight of leaf during a given period was greater in the lemon than in the orange or grapefruit, and the lemon formed roots most readily. The depth of the palisade tissue was about 20 per cent greater in the lemon, suggesting a connection between palisade development and the rooting ability of cuttings. The sap of lemon leaves was less active osmotically and contained less ash and calcium than orange leaf sap.

**The propagation of multiflora rootstocks for roses by soft wood cuttings,** H. B. TUKEY and K. D. BRASE (*New York State Sta. Bul. 598* (*1931*), *pp. 10, figs. 8*).—Excellent results were secured with softwood cuttings placed in shaded glass-covered frames on or about July 1. Of three rooting media tested, namely, bank sand, German granulated peat moss, and a mixture of equal parts of each, the first gave the best results, measured in rapidity of rooting and vigor of the new plants. Peat moss alone gave poor rooting and immature plants. As to the section of wood taken for cuttings, tips rooted more quickly, but the resulting plants did not ripen as well as basal and middle sections.

When cuttings were placed in closed and shaded frames and sprayed with water at frequent intervals wilting was not a factor, and the more leaves left on the cutting the larger the percentage of rooting in a given media. This method of propagation is deemed valuable for building up stocks of desirable strains, particularly thornless types.

**The effect of ethylene and illuminating gas on roses, P. W. Zimmerman, A. E. Hitchcock, and W. Crocker** (*Contrib. Boyce Thompson Inst., 3* (*1931*), *No. 3, pp. 459–481, figs. 8*).—Studies at the Boyce Thompson Institute showed that ethylene and illuminating gas caused drooping of the young leaves and in several cases abscission, which varied with the age of the leaf, the concentration of gas, temperature, duration of the exposure, and the variety of rose. The oldest leaves dropped first, and the middle aged were most persistent. No leaves dropped at 50° F. or lower. Butterfly was quite sensitive to ethylene and Pernet quite resistant. All concentrations of ethylene used (1 to 25,000 to 1 to 3,000,000) caused abscission, the only difference being in the time required to produce the effect. Ethylene caused an abnormally large number of latent rose buds to produce shoots, 70 per cent on treated plants and 44 per cent on controls. In shoot length ethylene-treated plants exceeded the controls by 62 per cent and in dry weight of new shoots by 33 per cent.

Gas caused yellowing of leaves, though in high concentrations abscission often occurred before discoloration. Gas exposure induced the rapid opening of cut flower buds approaching normal maturity, the petals dropping within 24 hours but color being unaffected. Buds on plants responded in much the same manner. Gas interfered with the growth of young shoots, practically stopping it after 48 hours. If injury was not too severe, growth was resumed upon the removal of the plant from the gas.

**Forcing plants with artificial light, A. Laurie and G. H. Poesch** (*Ohio Sta. Bimo. Bul. 153* (*1931*), *pp. 228–232*).—The supplementing of daylight with an additional period of 4 hours (6 to 10 p. m.) of electric light gave beneficial results with calceolaria, cineraria, Spanish iris, *Centaurea cyanus*, *C. imperialis*, scabiosa, Didiscus, schizanthus, feverfew, annual chrysanthemum, salpiglossis, coreopsis, gaillardia, Shasta daisy, and pansy. With gladiolus only 3 of 8 varieties tested responded to additional light, and with these the increase in flower production was not sufficient to pay for the cost of electricity.

## FORESTRY

**[Forestry at the Guam Station], J. Guerrero** (*Guam Sta. Rpt. 1930, pp. 18–20, figs. 3*).—The rapid growth of teak when grown under favorable conditions was indicated in measurements of trees set out 5 years. On a fairly heavy clay river bottom soil trees averaged 35 ft. in height and 6 in. in diameter. Some 3-year-old teak trees on a rich river bottom averaged 27.5 ft. in height and 4.75 in. in diameter. Mahogany 4 years old averaged 11 ft. in height on an area which had been covered with a heavy growth of *Leucaena glauca*. However, on an adjoining area where only native grasses had grown the growth was approximately one-half as much. Several species planted on an upland red clay of low fertility made only fair growth.

**Planting versus direct seeding of yellow poplar in the southern Appalachian region, C. F. Korstian and A. L. MacKinney** (*Jour. Forestry, 29* (*1931*), *No. 8, pp. 1178–1181*).—Tests conducted by the U. S. D. A. Appalachian Forest Experiment Station at several points in North Carolina differing in exposure and in preparation of the soil showed that planting is far superior to direct seeding in the case of the yellow poplar. At the end of the third growing season 95 per cent of the planted trees were alive, while at the end of the fourth growing season an average of only 40 per cent of the seed spots contained seedlings. The differences in vigor and height of the young trees were equally as marked.

**The period of height growth in some northeastern conifers, H. I. Baldwin** (*Ecology, 12* (*1931*), *No. 4, pp. 665–689, figs. 5*).—Weekly measurements of the length of the growing tip of a number of species of conifers, namely, white and red pines, balsam fir, white cedar, and red, black, and white spruces, growing under a variety of conditions in New England and New York, showed that height growth takes place during a period of about 12 weeks. Temperature appeared to be the determining factor, as little growth occurred until mean weekly soil and air temperatures reached 50° F. or until a period of warm weather had occurred. Trees about 2 meters high made the most rapid growth. Arranged in order of the time of beginning growth were white pine, balsam fir, and white, red, and black spruces. Trees in the open started more rapidly than those in the shade, and trees on south slopes were in advance of those on northern exposures.

**Temperature relations of lodgepole-pine seed germination, F. W. Haasis and A. C. Thrupp** (*Ecology, 12 (1931), No. 4, pp. 728–744, figs. 10*).—Employing seven maintained temperatures, ranging from 15 to 41° C., germination studies were conducted by Johns Hopkins University upon lodgepole pine seed collected in six localities in British Columbia, ranging in altitude from 350 to 1,500 meters. The seed from the highest elevations gave much better germination at 19° (66.2° F.) than did seed from the lower elevations. On the other hand, at 41° seed from the lowest elevation yielded the better germination. The first germination occurred at the higher temperatures, and for certain periods of incubation there were two optimal temperatures for germination. It was evident that in a given species seed produced in colder climates may be expected to germinate more quickly at rather lower temperatures than those obtained from a warmer climate, and vice versa. The importance of the source of seed is suggested.

**Some observations on southern pine seed, P. C. Wakeley** (*Jour. Forestry, 29 (1931), No. 8, pp. 1150–1164, figs. 5*).—Information on production, storage, testing, and handling of southern pine seed is presented. An examination of planted trees, especially loblolly pines, showed striking individual differences in juvenile form and vigor, not wholly attributable to site variations. An analysis of records showed a striking tendency for abundant cone crops to yield seed of strong viability. In stored seed, moisture content, as well as temperature, was found an important factor in maintaining viability.

**Effect of release upon the form and volume of western yellow pine, W. H. Meyer** (*Jour. Forestry, 29 (1931), No. 8, pp. 1127–1133, figs. 3*).—Stem analyses made on 174 western yellow pine trees located in 10 different forest areas in Washington and Oregon and released from 20 to 40 years ago showed a progressive change in form dating from the time of release. Previous to the release cutting the upper diameters had increased at a faster rate than diameters at breast height, while directly after release all form classes tended to converge into a single belt in which class 0.725 was most significant. As a result, the aggregate volume at any date was found to vary but slightly from the computed value taken from volume tables based on trees in virgin stands.

**Slash disposal in the western yellow pine forests of Oregon and Washington, T. T. Munger and R. H. Westveld** (*U. S. Dept. Agr., Tech. Bul. 259 (1931), pp. 58, pls. 4, figs. 12*).—The amount of slash per unit of lumber was greatest on poor sites with sparse stands and decreased with an increase in the volume of timber. The amount of slash varied with the species, being from two to three times as great in Douglas fir as in a similar stand of western yellow pine. The ground area occupied by slash varied with the method of logging, irrespective of the volume of slash. The rate of decay of slash varied with the species and with the manner of handling; for example, western yellow pine rotted more readily than white fir, lodgepole pine, western larch, and probably Douglas fir. Lopped slash dried more quickly and rotted more slowly than untreated slash, and piling delayed rotting.

Records showed the largest proportion of normal seedlings where slash was lightest, with some indication that light slash protects seedlings and favors germination. Fire hazard was influenced by grass, shrubby undergrowth, and fallen trees as well as by slash, and climate and exposure were also factors. Insects and fungi played a rôle in accelerating the decay of slash.

The economics of slash disposal tied up with various factors, such as the ultimate use of the land, the cost of disposal, etc. Seven methods of slash disposal, (1) broadcast burning, (2) spot burning, (3) piling and burning, (4) swamper burning, (5) no burning, (6) strip burning, and (7) partial piling and burning, are discussed, with comments as to the advantages and disadvantages of each. A slash disposal plan is outlined for a practically pure western yellow pine area in the Blue Mountains of Oregon, and in the appendix the technic of slash piling is outlined.

## DISEASES OF PLANTS

**A study of the histologic changes induced in leaves by certain leaf-spotting fungi,** H. S. Cunningham (*Phytopathology, 18 (1928), No. 9, pp. 717–751, figs. 10*).—The purpose of these studies was to determine to what extent certain histologic changes are induced by leaf-spotting fungi and whether such suscept responses play a major rôle in the restriction of their necrogenic activities. Individual responses are summarized.

The results here reported show clearly that whatever may be the factor or factors governing the limitation of the necrosis caused by fungi in leaf spot diseases, this limitation is not in the majority of cases due to the formation of a cicatrix or healing tissue. Responses to mechanical wounds are not necessarily like those made by fungus injury, though all of the suscepts which produced a cicatrix about a fungus necrosis also formed a cicatrix about mechanical injuries.

**The reactions of plant stems to fungous products,** C. R. Hursh (*Phytopathology, 18 (1928), No. 7, pp. 603–610, fig. 1*).—It is concluded from these studies that while the reaction of plant stems to fungus filtrates indicates an interference with the normal functioning of the water-conducting system, wilting is not, in itself, an adequate criterion as to the injurious character of fungus products to plant tissues. The age and condition of the stems, the length of time elapsed after cutting, and the treatment to which they are subjected during this period all influence the rapidity and degree of wilting that will occur when stems are placed in the fungus filtrates.

**The demonstration of bacteria in plant tissues by means of the Giemsa stain,** W. H. Wright and V. Skoric (*Phytopathology, 18 (1928), No. 9, pp. 803–807, pl. 1, fig. 1*).—A method is described of staining bacteria in plant tissues. Four species of bacteria were stained, including two intracellular symbionts and two plant pathogenes.

**Preliminary note on some serological studies of Aspergilli,** T. Matsumoto (*Phytopathology, 18 (1928), No. 8, pp. 691–696*).—A positive result of this investigation, undertaken to determine whether and how any species of Aspergillus can be differentiated by serological methods, is thought to have been to a certain extent attained.

**Progress of rust studies,** J. C. Arthur (*Phytopathology, 18 (1928), No. 8, pp. 659–674*).—This is an address delivered at the ninth annual meeting of the Canadian Division of the American Phytopathological Society at Winnipeg, Man., on December 20, 1927.

**The fungicidal action of liquid lime sulfur,** M. C. Goldsworthy (*Phytopathology, 18 (1928), No. 4, pp. 355–360, pl. 1*).—The results outlined confirm those of Eyre, Salmon, and Wormald (E. S. R., 44, p. 150) that the fungicidal properties of lime-sulfur solutions were entirely a function of the soluble polysulfide content. Liquid lime-sulfur solutions are instantaneously reacted upon by the protoplasm of the urediniospores and germ tubes of the peach rust fungus, *Tranzschelia punctata*. Globules of plastic sulfur are formed within the lumina of the germ tubes and within the spore cover. A method is given for the determination of plastic sulfur within the germ tubes and spores. The reduction of the protoplasm of the host, through the oxidation of polysulfide to elemental sulfur, appears to be an important factor in the fungicidal action of liquid lime-sulfur, as determined by its effect upon the growth of germ tubes and upon the germinability of spores.

**A field method of insuring positive attack with some cereal diseases,** W. W. Mackie (*Phytopathology, 18 (1928), No. 7, pp. 617–621*).—"For the past three years, careful and repeated observations on July-sown cereals have shown that the following cereal diseases may be induced in epidemic severity: On wheat, stem rust (*Puccinia graminis*), leaf rust (*P. triticina*), mildew (*Erysiphe graminis*), and spot blotch (*Septoria tritici*): on barley, stem rust (*P. graminis*), leaf rust (*P. anomala*), scald (*Rhynchosporium secalis*), net blotch (*Helminthosporium teres*), spot blotch (*H. sativum*), and mildew (*E. graminis*); and on oats, stem rust (*P. graminis avenae*), crown rust (*P. coronata*), and mildew (*E. graminis*)."

**The relation of temperature during the growing season in the spring wheat area of the United States to the occurrence of stem rust epidemics,** E. C. Stakman and E. B. Lambert (*Phytopathology, 18 (1928), No. 4, pp. 369–374, figs. 3*).—Noting the previous publication of relevant facts by Stakman and Levine (E. S. R., 40, p. 641), the authors present evidence that in the past there has been a tendency for destructive epidemics to develop in warm growing seasons and for cool seasons to be comparatively free from rust, and the purpose of this paper is to point out a more causal relationship. The graphs are based on more detailed information which is reserved for a later paper, dealing also with additional factors.

**The inheritance of resistance of oat hybrids to loose and covered smut,** G. M. Reed (*Ann. N. Y. Acad. Sci., 30 (1928), pp. 129–176*).—In a previous account (E. S. R., 55, p. 429), the facts obtained were in close accord with the view that a single-factor difference exists between the two parents, thus giving a simple monohybrid ratio of three resistant to one susceptible.

The present paper gives the results from additional crosses between Hull-less (seed 30) and Black Mesdag (seed 70), and with crosses involving other oat varieties. It is stated that the behavior of the descendants of these hybrids to loose smut (*Ustilago avenae*) and covered smut (*U. levis*) has been determined. In all the crosses involving varieties differing in their reaction to smut, resistance was dominant, susceptibility recessive, and segregation in the $F_2$ appeared to occur on the basis of a single-factor difference. It is concluded that the recombination of smut resistance with various desirable characters may be successfully accomplished.

**The inheritance of resistance to Puccinia graminis tritici in a cross between two varieties of Triticum vulgare,** C. H. Goulden, K. W. Neatby, and J. N. Welsh (*Phytopathology, 18 (1928), No. 8, pp. 631–658, figs. 8*).—In the present study, undertaken to obtain further information on the inheritance of high seedling and field resistance, and particularly on the relation between the two types of resistance, a cross was made between H-44-24, a *vulgare* derivative from a Marquis × emmer cross, and Marquis. The resistance in the descendants is indicated.

It appears that in one case indicated the same factors govern resistance to one form and susceptibility to another. Field results in one case indicated that resistance in the field is controlled by a single pair of factors only.

**New physiologic forms of Tilletia levis and T. tritici,** E. F. Gaines (*Phytopathology, 18 (1928), No. 7, pp. 579–588*).—In this paper, reporting investigations carried on in cooperation between the Washington Experiment Station and Bureau of Plant Industry, U. S. D. A., an account is given of the failure of wheats formerly resistant to smut and of studies on the conditions. In respect to the reaction on the resistant Turkeys, analyzing the tests of two years indicated that at least five forms of smut are present. Of these, *T. tritici* has three forms and *T. levis* has two.

**The life-history, cytology, and method of infection of Plasmodiophora brassicae Woron., the cause of finger-and-toe disease of cabbages and other crucifers,** W. R. I. Cook and E. J. Schwartz (*Roy. Soc. London, Phil. Trans., Ser. B, 218 (1930), No. B 455, pp. 283–314, pls. 3, fig. 1*).—Recent study applied to the life history and the cytology of *P. brassicae* is said to have yielded results confirmatory of previous work by several authors indicated. Critical comparisons are made between stages in *P. brassicae* and in the other genera in which the cytology has been worked out.

According to new information obtained regarding the mode of infection, the swarm spore affects the root hair, forming each a small amoeba which gives rise to a zoosporangium producing several zoospores each much smaller than a swarm spore. They migrate into the host tissue, fuse in pairs, and give rise to the plasmodia which are found in diseased roots. The amoebae which produce the zoospores develop very rapidly and disappear as the root hair dies. There is no fusion of the swarm spores, which simply spread the fungus. The organism most commonly found in the medullary ray tissue in young roots tends to increase both their size and development. No evidence was found that bacteria play any significant part in the life history of the fungus as regards infection. Though bacteria were sometimes present in the plasmodia, they appeared to be in process of ingestion.

A survey of all the species which have been placed in the genus Plasmodiophora has led the authors to exclude most of them. Latin diagnoses are given of the genus and the species which are considered as valid. A bibliography of 69 titles is given.

**A powdery mildew parasitizing Chinese cabbage,** W. H. Davis (*Phytopathology, 18 (1928), No. 7, pp. 611–615, pl. 1, fig. 1*).—A powdery mildew, supposedly unreported hitherto, was observed on the leaves and floral parts of Chinese cabbage (*Brassica pekinensis*) at Amherst, Mass., and was studied as to relationships, hosts, symptoms, and severity.

This disease is considered as not severe locally. Other crucifers affected include turnip, cabbage, and radish, but on these normal perithecia are not formed. The fungus is said to compare favorably with *Erysiphe polygoni.*

**Influence of environmental factors on the seasonal prevalence of corn smut,** F. R. Immer and J. J. Christensen (*Phytopathology, 18 (1928), No. 7, pp. 589–598, fig. 1*).—In view of conflicting reports on the effect of climatic factors upon the infection and prevalence of corn smut and on the relative susceptibility of seedlings, studies were made, employing artificially induced smut epidemics, to show the prevalence of infection in selfed lines and crosses. A comparison was also made of the reactions of lines of corn to normal field infection as well as to hypodermic inoculation with the smut-producing organism in the field and in the greenhouse.

Dry weather conditions were conducive to the prevalence of smut, temperature being a less important factor than either number of days of precipitation or percentage of sunshine. Corn seedlings were very susceptible when hypodermically inoculated. Infected seedlings were often killed. Observations and experiments for some years show that seedling infections with gall formation in the field are comparatively rare. The specific reason for this is not known. Environmental factors do not appear sufficient. It is thought possible that corn seedlings are morphologically or functionally resistant to natural field infection.

A correlation of +0.40±0.10 was found between natural infection in a smut epidemic and artificial infection of the same corn strains by hypodermic inoculation with a mixture of eight physiologic forms of smut. Some lines of corn were resistant to smut infection under natural conditions, as well as when hypodermically inoculated with a mixture of sporidia of eight forms of smut when the plants were 3 ft. high. Other lines were resistant to natural infection but susceptible when hypodermically inoculated.

**Determination of losses due to smut infections in selfed lines of corn,** F. R. Immer and J. J. Christensen (*Phytopathology, 18 (1928), No. 7, pp. 599–602*).—In a study to determine the effect of smut galls of several sizes and of different locations on the plant in reducing yields of selfed lines of corn, the yield of shelled corn was influenced by the size of the smut galls, the larger reducing markedly. Infections above the ear reduced the yield significantly more than did galls below the ear.

**A consideration of the pathogenicity of the cotton-wilt fungus, Fusarium vasinfectum,** H. R. Rosen (*Phytopathology, 18 (1928), No. 5, pp. 419–438, figs. 4*).—Previous experimentation (E. S. R., 56, p. 545; 58, p. 48) having shown that the presence of nitrates in nutrient media leads *F. vasinfectum* to produce substances that are toxic to cotton, greenhouse soil experiments were undertaken involving the use of pure quartz sand and of sandy loam soil low in nutrients.

In heavy infestations, the jars receiving nitrate of soda showed complete inhibition of germination, while the two types of controls, jars with equivalent amounts of nitrate but without any cotton wilt fungus, and jars with the fungus but without nitrate, showed no hindrance in germination. It is shown that the fungus is primarily a cortical rot producer of roots and of lower stem parts, and that it gains entrance mainly through wounds. The fungus also kills elongated feeding roots without penetrating deeply enough to cause wilt.

From attempts at artificial wilt production, it is concluded that this fungus is far more limited in its wilt-producing capabilities by certain soil factors than are other species of Fusarium. Succulence and the perpetuation of the juvenile stage appear particularly conducive to wilt. Factors favoring such conditions, as excessive moisture and improper or unbalanced nutrients, appear to be necessary for the fungus to produce wilt. Nematodes, wireworms, and Rhizoctonia lesions, which may disrupt root tissues or hinder their normal development, condition invasion by Fusarium.

It is concluded that most cotton varieties are, under proper conditions, resistant to wilt, and that good farming practice, involving the use of manure or a green manurial crop, helps materially to control wilt in the United States.

**An ascomycetous leaf spot of cowpea,** L. R. Tehon and G. L. Stout (*Phytopathology, 18 (1928), No. 8, pp. 701–704, fig. 1*).—A brief account and description are given of *Leptosphaerulina vignae* n. sp., associated with leaf spot of cowpeas seen in 1927 near Huey, Clinton County, Ill.

**Spraying and dusting cucumbers for control of downy mildew from 1925 to 1930**, G. F. Weber (*Florida Sta. Bul. 230 (1931), pp. 58, fig. 1*).—Over a period of six years various protective materials were tested for the control of downy mildew on cucumbers. In three of the six years, namely, 1926, 1928, and 1930, copper stearate was the most effective material from point of yield. In 1925 copper hydroxide led, in 1927 no treatment, and in 1929 a 2-4-50 Bordeaux mixture gave the best results. The cost per hamper of cucumbers of the increased yield was more than twice as much with copper stearate as with Bordeaux mixture. Hydrated lime as a component of Bordeaux mixture gave as good results as did rock lime and was cheaper and more available. Calcium caseinate added to sprays did not increase their effectiveness. Sulfur in various forms was actually detrimental to the cucumber plants. In comparison with check plats, the data show that with Bordeaux mixture 14 per cent more cucumbers were produced, and with copper-lime dust a 13 per cent increase, these being the only treatments to show a profit.

**Hop leaf roll** [trans. title], R. Kirschner (*Biol. Gen., 5 (1929), No. 2, pp. 225-238, pl. 1, figs. 2*).—The author records results of observations on what he has termed hop leaf roll, distinguishing this condition from crinkle, as seen in hop and potato, and from other leaf distorting causes. *Ascochyta humuli*, though present (somewhat late in the development of the disease), is thought to have nothing to do with its causation, which is deemed to be some metabolic disorder. The presence of small granules of phaeophytin in the chlorophyll grains is noted, but it is concluded that this is not primarily causal.

**Blight-resistant potatoes**, D. Reddick (*Phytopathology, 18 (1928), No. 6, pp. 483-502*).—This is a second report of the progress accomplished in the development of a potato (*Solanum tuberosum*) resistant to late blight (*Phytophthora infestans*) (E. S. R., 53, p. 852).

It is stated that the potato variety Ekishirazu from Japan remained highly resistant to *P. infestans* at Ithaca, N. Y., during 1921 to 1927, inclusive. This variety has, however, no commercial possibilities in New York. Hybrids with various varieties have yielded 46 strains possessing the approximate resistance of Ekishirazu, some decidedly tolerant to dry weather and some worthy of tests on a commercial scale. *P. infestans* is thought to have been introduced into South America and into Europe on some other solanaceous host.

**The infectious nature of potato calico**, D. R. Porter (*Hilgardia [California Sta.], 6 (1931), No. 9, pp. 277-294, pl. 1, figs. 6*).—Potato calico, a degeneration disease of the Irish potato manifested in irregular patches of various shades of yellow on the leaflets of infected leaves, was found to be perpetuated in the tuber. The evidence that this disease may be transmitted by tuber grafting was doubtful. Natural spread was apparent in the field, the distance, direction, and rapidity of spread suggesting that insects may act as carriers.

Infection was obtained by inoculating healthy leaflets with unfiltered juice taken from diseased plants, but no symptoms could be obtained in healthy plants when the inoculum was first filtered. The minimum inoculation period was about 15 days.

**Transmission of potato spindle-tuber by grasshoppers (Locustidae)**, R. W. Goss (*Phytopathology, 18 (1928), No. 5, pp. 445-448*).—Supplementing the observations of Schultz and Folsom (E. S. R., 50, p. 46) and other experimentation that aphids transmit spindle tuber, tests have been made with other insects commonly found in potato fields.

The successful transfer of the spindle tuber virus to healthy plants by grasshoppers accounts for some of the previously unexplained spread of the disease, particularly in the irrigated districts of western Nebraska. Experiments conducted with other potato insects indicate that several of these may be able to transmit the spindle tuber disease. It was found that both mild mosaic and rugose mosaic failed to spread under the same conditions that resulted in a considerable spread of spindle tuber.

**Transmission of the virus of curly-top of sugar beets through different solutions,** W. Carter (*Phytopathology, 18 (1928), No. 8, pp. 675–679*).—Data are given of studies suggested in work previously reported (E. S. R., 57, p. 359). Sugar beet curly top was transmitted by leafhoppers fed a suspension of crushed viruliferous leafhoppers in weak aqueous solutions of various sugars. The disease was transmitted also by leafhoppers fed on diseased beet juice in a 1 per cent aqueous solution of sucrose, likewise by those fed a solution on which viruliferous leafhoppers had previously fed. The incubation periods were, as a rule, prolonged in these instances.

**Filtration experiments on curly top of sugar beets,** H. H. P. Severin and O. Swezy (*Phytopathology, 18 (1928), No. 8, pp. 681–690. pl. 1, figs. 2*).—The authors follow up an account previously noted (E. S. R., 51, p. 255), showing now that a filtrable stage of the virus of curly top occurs both in beets and in the beet leafhopper which transmits the disease.

**Downy mildew of the beet, caused by Peronospora schachtii Fuckel,** L. D. Leach (*Hilgardia [California Sta.], 6 (1931), No. 7, pp. 203–251, figs. 13*).—*P. schachtii*, known to occur to a limited extent on sugar beets in California since 1911, causes serious losses to garden and seed beets, attacking the plants in all stages of development. Under field conditions, the first symptoms in beet root beds usually appeared as isolated irregular lesions on the older leaves, later attacking the youngest leaves and causing the center of the beet rosette to become highly distorted. Flower shoots were often invaded systemically, resulting in stunting and distortion.

Inoculation studies upon young plants under controlled conditions showed the following to be susceptible: Garden beets, mangels, sugar beets, Swiss chard, *Beta bourgaei*, *B. bourgaei* × *B. procumbens*, *B. macrocarpa*, *B. maritima*, *B. patellaris*, *B. patula*, *B. procumbens*, *B. scutellaris*, and *B. vulgaris abyssinica*. No infection was obtained on *Chenopodium album* and *C. murale*. Downy mildew on the beet and that on spinach were pathogenically different.

Controlled studies showed that a temperature of from 2 to 10° C. is favorable for conidial germination, with an optimum between 4 and 7°. The minimum was below 0.5° and the maximum near 30°. Conidial germination was initiated within 2 hours at temperatures of from 6 to 25° and within 3 to 3.5 hours at 4°. The length of germ tube varied from 240 to 480μ at the end of 24 hours with the greatest development occurring at 12°. Short periods of freezing did not affect the viability of conidia, and a few were found to be capable of germinating after 40 days at −12°. A high percentage of infection was obtained on beet seedlings sprayed with conidial suspensions at temperatures between 0.5 and 20° and slight infection at 30°. Cotyledons and newly formed leaves were found to be the most susceptible portions of the beet seedlings. Abundant oospores were found in the leaves and flowers of seed beets and in cotyledons and young leaves of seedlings exposed to infection under artificial conditions. Attempts to germinate oospores were not successful.

Microscopical studies showed the fungus mycelium to spread from the young infected rosette leaves into the crown, and leaves and flower shoots subsequently formed were completely invaded. Mycelium and oospores were found in the pericarp and sepals of beet flowers and occasionally in the funiculus and the integuments of the ovule. Mycelium and haustoria resembling those of *P. schachtii* were found inside the testa of viable seed from seed balls bearing dry conidiophores on their surfaces. Infected seedlings were obtained from seed of infected plants and from commercial seed, both lots planted in sterilized soil. At the same time seed from disease-free regions produced no infected seedlings, suggesting that mildew is transmitted in the seed. The author believes that the fungus hibernates by means of a perennial mycelium in the beet crown.

No adequate control was found, but the use of disease-free seed, the avoidance of infected fields, and the elimination of infected stecklings are suggested.

**Development of strains of cigar wrapper tobacco resistant to black shank (Phytophthora nicotianae Breda de Haan),** W. B. Tisdale (*Florida Sta. Bul. 226 (1931), pp. 45, figs. 12*).—Beginning with a discussion of the nature of the black shank disease and of methods of hybridization and selection employed in the development of resistant strains of tobacco, the author describes several promising strains developed at the station and presents the results of comparisons of these strains with ordinary commercial tobaccos.

Only a few varieties among a large number of commercial kinds tested for resistance showed these characteristics. Continued selection from these resistant varieties did not enable the isolation of completely resistant strains, resistance apparently not being controlled by a simple genetic factor.

The presence of root knot nematodes decreased resistance in otherwise highly resistant strains, and deep cultivation continued late in the season was also detrimental. High temperature accompanied by low rainfall decreased resistance, which could not be correlated directly with any type character of tobacco. Of the several resistant strains developed by the station, three, P, 301, and 94, were disseminated to commercial growers, and 94 is said to yield a cured leaf superior in quality to that of any other variety tested.

**Effects of mosaic upon the chlorophyll content of tobacco,** A. A. Dunlap (*Phytopathology, 18 (1928), No. 8, pp. 697–700, fig. 1*).—It is claimed that tobacco mosaic lowers the chlorophyll (a+b) content of any given leaf of the plant in a way which is characteristic at all growth stages. The chlorophyll content of young tissues is somewhat more seriously affected than is that of older tissues, and the total chlorophyll content of the plant is seriously reduced.

**The migration of Bacterium tumefaciens in the tissue of tomato plants,** J. B. Hill (*Phytopathology, 18 (1928), No. 7, pp. 553–564, pl. 1, fig. 1*).—It is claimed that *B. tumefaciens* migrates as zoogloeae through the intercellular spaces of the subepidermal layer and those of the pith in young tomato plants. The rate of growth of the zoogloeae through the intercellular spaces is said to be from 0.020 to 0.04 mm. a minute, the most rapid rate occurring in the early stages of the migration following the introduction of the bacteria into the young tomato stems. The rate, which is most rapid for the first 30 minutes following inoculation, is reduced to one-half after 3 hours.

**Studies concerning the so-called bitter pit of apples in Australia, with special reference to the variety Cleopatra,** W. M. Carne, H. A. Pittman, and H. G. Elliot (*Aust. Council Sci. and Indus. Research Bul. 41 (1929), pp. 101, figs. 37*).—This somewhat preliminary report of cooperative work by the Department of Agriculture of Western Australia and the Council for Scientific and Industrial Research, is presented in elaborately systematized form, with a bibliography. An appendix deals with evidence in English market reports on the relation of shipping dates to diseases listed, also with evidence of bitter pit loss in Western Australian apples during the 1928 season.

**Some fungi of the Stemphylium type and their relation to apple rots,** G. A. Newton (*Phytopathology, 18 (1928), No. 7, pp. 565–578, figs. 7*).—In this account, an abridgment of a thesis, it is claimed that the black rots referred to as Alternaria rot are caused by several different fungi, among these two species producing conidia of the Macrosporium-Stemphylium type. Study showed one of these to be a perithecium-producing form, which is here described as *Pleospora mali* n. sp. The other is a nonperithecium-producing form here described as *S. congestum* n. sp.

**Root and crown injury to apple trees,** H. E. Thomas (*Phytopathology, 18 (1928), No. 6, pp. 547–551*).—Presenting observations and experimental results additional to those previously noted (E. S. R., 54, p. 851), the author maintains that fungi are, at most, secondary agents in the production of root and crown injury in New York State. Optimum growth conditions, particularly drainage, are urged as favoring prevention and recovery, with supplemental use of approach grafting.

**Crimp—a nematode disease of strawberry,** A. N. Brooks (*Florida Sta Bul. 235 (1931), pp. 27, figs. 5*).—Crimp, a bud disease affecting the development of the young leaves of the strawberry, occurs most frequently during warm, moist weather, July to October. Following periods of cool weather diseased plants apparently recovered but suffered again when warm weather prevailed.

Uniformly successful inoculations were made by introducing suspensions of nematodes (*Aphelenchus fragariae*) into buds of healthy plants, whereas hypodermic inoculations of the filtered extract of diseased plants failed to produce the disease, nor was it transmitted by the aphids *Myzus fragaefolii* or *Aphis forbesi*.

The thermal death point for the nematodes was found to be 48° C. for 20 minutes or 47° for 30 minutes. Potted crimped plants immersed in warm water, 48° for 20 minutes, were restored to normal growth, but the method is deemed too tedious for commercial usage.

Field infestation of strawberry buds by nematodes from the soil was accomplished chiefly by heavy rains and by water washing over the plants. Tips of runners became infested as they pushed through infested axillary spaces of the leaves. The crimp disease was introduced into clean soil by the use of infested nursery stock.

As methods of control, the author suggests that disease-free plants be set on disease-free soil. Setting out healthy stock at the end of the summer rainy period reduced the danger of buds becoming infested from the soil. The roguing of nursery beds was useful on well-drained soil but valueless on wet soil. The renewal of strawberry beds each year decreased nematode population.

**Diseases of citrus in Florida,** A. S. Rhoads and E. F. DeBusk (*Florida Sta. Bul. 229 (1931), pp. 213, figs. 100*).—Beginning with a general discussion of the importance of drainage, resistant rootstocks, good cultural practices, etc., in the prevention of disease, and with instructions for the preparation of Bordeaux mixture, Bordeaux-oil emulsion, lime-sulfur, and other fungicides, specific information is presented on the symptoms of various diseases occurring in Florida and on methods of prevention and control.

**Preliminary note on snowberry anthracnose,** M. F. Barrus and J. G. Horsfall (*Phoytopathology, 18 (1928), No. 9, pp. 797–801, pls. 2*).—Snowberry (*Symphoricarpos albus laevigatus*) near Ithaca, N. Y., is often affected severely by defoliation and by destruction of the berries. The name anthracnose is applied because of the resemblance of the causal fungus to that causing raspberry anthracnose. The disease is destructive in three counties of New York, and specimens have been recorded from Arkansas, Iowa, and Wisconsin. The symptoms are described. The organism is described as a new species, *Sphaceloma symphoricarpi*.

**A conspectus of needle rusts on balsam firs in North America,** J. S. Boyce (*Phytopathology, 18* (*1928*), *No. 8, pp. 705–708*).—This is given in tabular form with notes.

**A possible alternate stage of Pucciniastrum myrtilli (Schum.) Arth.,** J. S. Boyce (*Phytopathology, 18* (*1928*), *No. 7, pp. 623–625*).—It is supposed, on the basis of the evidence, here presented as admittedly circumstantial and incomplete, that *Peridermium* sp. on needles of the previous season of silver fir on Mount Hood, Oreg., differs from other Peridermiums in this region, and that it may be the aecial stage of *Pucciniastrum myrtilli.*

**Note on the occurrence of intracellular bodies in spike disease of sandal (Santalum album Linn.),** M. J. Narasimhan (*Phytopathology, 18* (*1928*), *No. 9, pp. 815–817, figs. 3*).—Recent work has supported the statement of Coleman (E. S. R., 38, p. 855) that the appearance of spike in sandal (*S. album*) has nothing to do with the parasitic nature of sandal, which is claimed to be connected with the presence of intracellular bodies in the cells of the spiked leaf. Similar bodies are said to have been found by the present author in the leaves of *Vinca rosea* affected by a similar disease, and an allusion is made to similar bodies reported by workers in connection with virus diseases of such plants as tobacco, wheat, and Hippeastrum.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Fur laws for the season 1931–32,** H. P. Sheldon and F. G. Grimes (*U. S. Dept. Agr., Farmers' Bul. 1685* (*1931*), *pp. II+30*).—This is the seventeenth annual summary of the fur laws (E. S. R., 64, p. 237).

**The insect menace,** L. O. Howard (*New York and London: Century Co., 1931, pp. XV+347, pls. 32, figs. 48*).—Following the introduction to this work, intended to arouse the public to an appreciation of the very real menace of insects to humanity, chapters are devoted to the length of time insects have existed on the earth, why the insect type has persisted, some other important facts, the problem confronting us, injuries aside from damage to crops, the world is waking up, and three instances of progress.

**Statistical methods of value in field entomology,** S. Lockwood (*Jour. Econ. Ent., 24* (*1931*), *No. 5, pp. 971–978*).—This is a discussion of methods of sampling insect populations and statistical ways of judging the value of average samples.

**The Robinson method for determination of bound and free water in the insect body,** F. S. Bodenheimer and O. T. Schmidt (*Jour. Econ. Ent., 24* (*1931*), *No. 5, pp. 1090–1093*).—In this contribution from the Minnesota Experiment Station the authors describe the fundamental experiments of W. Robinson on the relation of hydrophilic colloids to winter hardiness of insects as reported in 1928.[1]

**The diapause phenomenon in insects, with special reference to Rhagoletis completa Cress. (Diptera: Trypetidae),** A. M. Boyce (*Jour. Econ. Ent., 24* (*1931*), *No. 5, pp. 1018–1024*).—In this contribution from the California Citrus Experiment Station some of the more important facts relative to the diapause phenomenon in insects are summarized. Data are presented based upon preliminary experiments with various chemicals employed in an attempt to break the dormancy of pupae of the walnut husk fly (*R. completa*).

**[Notes on economic insects and their control]** (*Jour. Econ. Ent., 24* (*1931*), *No. 5, pp. 1108–1111*).—The contributions here presented are as follows:

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[1] In Colloid Symposium Monograph, V, edited by H. B. Weiser. New York: Chem. Catalog Co., 1928, vol. 5, pp. 199–218, figs. 9.

Neonicotine Recently Found as an Alkaloid in *Anabasis aphylla* L, by C. R. Smith (p. 1108); A Successful Method for Sampling Populations of Quick Moving Insects, by D. M. DeLong (pp. 1108, 1109); Notes on *Ophelosia crawfordi*, by H. S. Smith and H. Compere (pp. 1109, 1110); Adhesives and Carriers for Insecticidal Dusts, by S. F. Potts and D. F. Barnes (pp. 1110, 1111); and *Gelechia desiliens* Attacks Sycamores, by H. M. Armitage (p. 1111).

**[Contributions on economic entomology]** (*Quebec Soc. Protect. Plants, Ann. Rpt., 22 (1929–30), pp. 17–26, 30–47, 79–85, figs. 5, pp. 86–91*).—The contributions here presented are as follows: Spray Circles in the Annapolis Valley, by S. V. Nichols (pp. 17, 18); Petroleum Oil, Source and Method of Using as an Insecticide, by F. A. Herman (pp. 19–26); Bees and Pollination of the Apple—A Review of the Literature, by C. E. Atwood (pp. 30–32); Control of Plum and Apple Curculios (pp. 33, 34) and Notes on the Borer Mixture Calcium Cyanide and Raw Linseed Oil (pp. 35, 36), both by C. E. Petch; The Apple and Thorn-Leaf Skeletonizer (*Hemerophila pariana* Clerck), by J. M. Cameron (pp. 37–43); Summary of the Papers on Orchard Entomology, by W. H. Brittain (pp. 44–47); Some Methods in the Study of Physical Conditions Affecting Forest Insects, by J. J. DeGryse (pp. 79–85); An Investigation of Monochamus Beetles and Their Control, by M. B. Dunn (pp. 86–88); and The Hemlock Looper Infesting Balsam in the Province of Quebec, by E. B. Watson (pp. 89–91).

**Report of the entomologist,** S. R. VANDENBERG (*Guam Sta. Rpt. 1930, pp. 23–25*).—The European corn borer, which has become rather widespread in Guam, was the principal insect pest occurring on the island. In work with parasites an attempt to establish *Exeristes roborator* was continued (E. S. R., 64, p. 848), but was handicapped through the scarcity of growing corn. The results of attempts to keep the eggs of the parasite in cold storage for use when the host material would be abundant, at temperatures between 48 and 50° and 35 and 45° F., reported in tables, were not encouraging. The larvae of the camachile pod worm (Plethreutidae) as host food for this parasite were found to be as acceptable as the corn borer larvae and superior in keeping qualities.

The distribution of the house-fly and stable-fly parasites (*Spalangia* sp.) was continued, a parasitism of from 75 to 80 per cent of the pupae on the station premises having been determined.

The white grub (*Lachnosterna* sp.), attacking approximately 1 per cent of the roots and stems of the pineapple crop, was controlled through the application of carbon disulfide on bits of cotton (three to each plant) set beneath the soil close to the stems.

**Some recent parasite introductions in Hawaii,** O. H. SWEZEY (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 945–947*).—The author reports that the introduction of parasites from the Orient in 1928, including the egg parasite *Trichogramma japonicum* Ashm. and two parasites of the larva, *Amyosoma chilonis* Vier. and *Diocles chilonis* Cush., brought about a fairly satisfactory control of the rice borer *Chilo simplex* (Butl.) which appeared for the first time in the rice fields of the island of Oahu early in 1928 (E. S. R., 61, p. 357). Mention is made of the introduction of insect enemies of the pineapple mealybug (*Pseudococcus brevipes*), the pink sugarcane mealybug (*Trionymus sacchari* (Ckll.)), and the Chinese grasshopper (*Oxya chinensis*).

**Present trend of oil sprays,** E. R. DE ONG (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 978–985, fig. 1*).—In this discussion of the types of oil now commonly used on the Pacific coast, it is pointed out that the present tendency of using oils with a larger amount of sulfonatable material is possible through the use of lower viscosities. Such oils are cheaper than the heavier and more highly refined ones and also for some purposes may have a greater insecticidal value. Laboratory data are given on the values for oils of different viscosities, also changes in viscosity through field temperature variations. The preservative action is shown of pine-tar oils when used in small percentages with emulsions made with casein or blood albumin.

**Studies on the oil depositing qualities of oil spray mixtures,** R. H. Smith (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 985–991, pl. 1*).—This contribution from the California Citrus Experiment Station deals with the subject under the headings of factors relating to the performance of oil spray mixtures, quantity of oil deposited by proprietary emulsions, quantity of oil deposited in relation to insect control and safety to tree, the function of emulsifiers or spreaders, and emulsifiers or spreaders in relation to the character of the oil deposit.

**History of the oil and nicotine combination,** F. B. Herbert (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 991–997*).—A history is given of the oil and nicotine combination, together with a list of the pests it will control.

**The pyrethrin I content of pyrethrum powders as an index of insecticidal power,** H. H. Richardson (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1098–1106, fig. 1*).—The author found the pyrethrin I content of several fresh pyrethrum powders to give an accurate evaluation of the insecticidal power of kerosene extracts of these flowers. Pyrethrin I was analyzed by Tattersfield's short acid method (E. S. R., 62, p. 244). Insecticidal power was estimated by the speed of paralytic action against house flies. A correlation coefficient of 0.987 was found between these two factors. This conclusion was found to hold true for deteriorated pyrethrum as well as for fresh powder.

**Vacuum fumigation of pineapple planting material,** H. R. Hagan (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1002–1012*).—In preliminary tests made at the Hawaiian Pineapple Canners' Experiment Station to determine the resistance of planting material and its parasites to various dosages of gases applied in a vacuum fumigator, the material proved to be quite intolerant to carbon disulfide, considerably more resistant to chlorpicrin, and withstood, without injury, heavy charges of hydrocyanic acid gas. The last also gave satisfactory control of the parasites within the tolerance limits of the host.

**A study of fumigation problems: "Protective stupefaction," its application and limitations,** F. S. Pratt, A. F. Swain, and D. N. Eldred (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1041–1063. pls. 4, figs. 8*).—The authors point out that in the fumigation of citrus trees with hydrocyanic acid for the control of scale pests certain of the scale insects when first exposed to sublethal concentrations become stupefied and consequently more resistant to the action of hydrocyanic acid than do scale insects not so stupefied.

"Extensive experiments show that an exposure of more than one minute, but less than three minutes, to such sublethal concentrations is necessary, however, to cause this increased resistance. Studies of the concentration and distribution of hydrocyanic acid under fumigation tents show that under summer night fumigation conditions uniform distribution of hydrocyanic acid is accomplished in a short enough period of time to prevent any protection by stupefaction when hydrocyanic acid is applied either with an atomizer or vaporizer, but that under winter daylight conditions the atomizing pump does not produce sufficiently rapid distribution of hydrocyanic acid to prevent this phenomenon. At any time when the temperature of the ground under the tent is lower than the temperature of the air above, and consequently no convection currents are present, it is necessary to use the vaporizer to obtain quick and uniform distribution of hydrocyanic acid."

**Insecticides, equipment, and methods for controlling orchard insect pests,** A. L. Quaintance and E. H. Siegler (*U. S. Dept. Agr., Farmers' Bul. 1666 (1931), pp. [1]+93, figs. 78*).—This is a revision of and supersedes Farmers' Bulletin 908, previously noted (E. S. R., 38, p. 843).

**Lubricating-oil sprays for use on dormant fruit frees,** A. L. Quaintance, E. J. Newcomer, and B. A. Porter (*U. S. Dept. Agr., Farmers' Bul. 1676 (1931), pp. II+18, figs. 15*).—This practical account gives directions for the preparation, storage, and use of lubricating oil emulsions, describes the different emulsifiers that have been found suitable for the preparation of these sprays, and gives specifications to guide the grower in selecting the proper kind of oil for use in orchard spraying. The orchard insects which may be readily controlled by the use of oil are briefly discussed, and the proper strength of lubricating oil emulsion for the control of each species is indicated.

**Control of flea beetle and hornworm on tobacco,** S. Marcovitch and W. W. Stanley (*Tennessee Sta. Circ. 38 (1931), pp. 2, figs. 2*).—A practical account.

**Flame-throwers in locust (Schistocerca gregaria, Forsk.) control,** K. A. Rahman (*Agr. and Livestock in India, 1 (1931), No. 4, pp. 382–395, fig. 1*).—The results of experiments conducted at the Punjab Agricultural College are reported, and descriptions of the flame-throwing machines developed are presented. The flame thrower used is essentially a pneumatic knapsack sprayer fitted with a flame-projecting appliance.

It was found that flame throwers are unsatisfactory as the chief means of dealing with the locust problem, but serve a very useful purpose as a subsidiary method of control. It is especially difficult to destroy hoppers resting among thick, green hedges by means of flame throwers. Thick hopper bands resting on shrubs or bushes which either easily catch fire or allow the flame to penetrate into every part can be effectively controlled. The times most suitable for working the flame thrower were found to be from 6 to 9 a. m. and from 5.30 to 7.30 p. m. Though limited in its application, the flame thrower was found also to be an excellent appliance for speedily destroying benumbed, copulating, egg-laying, and newly emerged adults.

**Western Thysanoptera of economic importance,** D. Moulton (*Jour Econ. Ent., 24 (1931), No. 5, pp. 1031–1036*).—This is a discussion of the principal thrips pests found in California, of which there are seven species of major economic importance, namely, the greenhouse thrips, *Hercothrips fasciatus* Perg., the orange thrips, *Drepanothrips reuteri* Uzel, *Frankliniella californica* Moulton, the onion thrips, and the pear thrips.

**Industry meeting quarantine: The bean thrips,** R. S. Woglum (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1013–1018, fig. 1*).—This is an account of fumigation work with hydrocyanic acid for *Heliothrips fasciatus* Perg. on packed citrus fruit, conducted with a view to meeting the requirements for movement of the fruit from California into the Hawaiian Islands. The work showed that eradication of the thrips was possible in a gas-tight inclosure with a dosage of ⅝ oz. of sodium cyanide to 100 cu. ft. for 35 minutes, and it has since been widely used commercially. Data are presented showing that such factors as temperature of the washing solution, interval between packing and fumigation, presence of an artificial wax covering, etc., influence fruit damage. The greater susceptibility of oranges over lemons to pitting is indicated as due in large part to morphological differences of the two fruits.

**Tarnished plant bug injury to pears in Washington,** R. L. Webster and A. Spuler (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 969–971*).—In this contribution from the Washington College Experiment Station the authors report that the damage to pears and apples by the tarnished plant bug was particularly severe in the State in 1930. Pear orchards with a luxuriant cover crop of alfalfa or sweetclover were especially subject to injury. For a 14-day period beginning March 31, when pear blossom buds were swelling and particularly subject to injury, the effective temperatures (above 50° F.) were especially favorable in 1930, much less so in 1931, and still less in 1929. It is believed that the severe damage in 1930 was due to the prevailing temperatures during this period, which were especially conducive to insect activity.

**Modes of curly-top transmission by the beet leafhopper, Eutettix tenellus (Baker)**, H. H. P. SEVERIN (*Hilgardia* [*California Sta.*], *6* (*1931*), *No. 8, pp. 253–276, figs. 6*).—Following a short review of the literature on the subject the author reports upon methods, short periods of curly top transmission by the beet leafhopper, transmission of curly top by single beet leafhoppers, and mass inoculation, the details being given in tabular form.

In short-period transmission experiments, 40 previously noninfective beet leafhoppers after feeding on a diseased beet transmitted curly top to a healthy beet within 20 minutes. The percentage of curly top transmission varied with the time that the healthy beet was exposed to infection as follows: 20 minutes 2.4 per cent, 0.5 hour 14.3, 1 hour 2.9, 1.5 hours 16.7, 2 hours 15, 3 hours 27.8, and 4 hours 33.3 per cent. When 20 to 50 adults were used, the transmission of the disease within 20 minutes to 4 hours averaged 7.3 per cent with 96 beets, as compared with 22.5 per cent with 129 beets when more than 50 hoppers were used. Curly top was not transmitted when 5 to 15 insects were used in short-feeding intervals.

A number of experiments in which the time of exposure of single noninfective beet leafhoppers on diseased and healthy plants was varied gave the following results: A total of 203 leafhoppers after feeding singly on diseased and healthy beet seedlings for periods varying from 2 to 11 hours transmitted curly top to only 4 of 203 beets. The shortest period for a single insect to transmit curly top was 7 hours. Fifty leafhoppers with a virus incubation period of from 13 to 23 hours, tested singly, transmitted curly top to 9 of 300 beets. In another experiment 20 males with a virus incubation period of from 12 to 24 hours, fed singly on 140 beets, failed to transmit curly top. When lots of 5, 10, 20, 40, or 80 leafhoppers fed hourly on different healthy beets, the size of the dose of the virus was increased. Infection was produced oftener with 40 or 80 insects than with 5, 10, or 20 hoppers.

The relation of mass inoculation by groups of beet leafhoppers to curly top transmission was demonstrated by varying the time of exposure of the insects on healthy beets. The percentage of curly top transmission by single insects with virus incubation periods of from 1 to 7 days varied from 13.3 to 40 per cent, the lowest percentage occurring at the end of 1 day. The mouth parts were contaminated with the curly top virus after the leafhoppers had fed on a diseased beet for periods of 0.5 to 1 hour. Noninfective nymphs after feeding on culture media containing the excreta or on the filtrate prepared from the feces failed to transmit curly top to healthy beets.

**Introduced parasites successfully control the citrophilus mealybug**, H. S. SMITH and H. COMPERE (*Jour. Econ. Ent.*, *24* (*1931*), *No. 5, pp. 942–945*).—In this contribution from the California Citrus Experiment Station, the authors report that the introduction of the two chalcidoid parasites *Coccophagus gurneyi* Comp. and *Tetracnemus pretiosus* Timb. from Australia, as previously noted (E. S. R., 61, pp. 456, 758), has resulted in perfect control of *Pseudococcus gahani*.

**A new menace to Scotch and jack pine,** J. H. Allison and L. W. Orr (*Jour. Forestry, 27 (1929), No. 7, pp. 821–824*).—This contribution from the Minnesota Experiment Station reports upon the jack pine Lecanium (*L.* (*Toumeyella*) *numismaticum* P. and McD.), a member of the tortoise-scale group, which has since 1926 made its appearance in epidemic numbers in the Lake Vadnais jack and Scotch pine plantations about 7 miles north of the city of St. Paul. The pest is said to have been present for several years on jack pine in Nebraska, in which State it was first observed in Saline County in 1911, apparently having been introduced on nursery stock of uncertain origin. The scale passes the winter as a hibernating fertilized female on the bark of twigs and smaller branches of jack and Scotch pine. The scales are often crowded so closely together on the bark surface that they overlap like shingles on a roof. The males mature in the fall and emerge from under the thin, waxlike scales that have protected them during their development.

Severely infested trees have a wilted appearance, characterized by the sooty appearance of the branches and needles due to the growth of fungi in the insect secretions. The lower branches of the trees are attacked first, the upper part of the tree usually remaining free from the scale until it has become so firmly established that the tree is dying.

**Studies on natural vs. artificial control of the pine tortoise scale,** L. W. Orr (*Minnesota Sta. Tech. Bul. 79 (1931), pp. 19, figs. 4*).—This is a preliminary report on several phases of the study of the relation of *Lecanium* (*Toumeyella*) *numismaticum* P. and McD. to the management of jack and Scotch pine plantations, made in 1929 during an outbreak of the pest at Lake Vadnais. A brief account of this insect by Allison and Orr is noted above.

The natural enemies of this scale were found to be so effective on the check areas that the spraying may have done more harm than good. The application of an oil emulsion appeared to have caused the coccinellids to concentrate on the unsprayed trees, and it is thought that they might have been as effective over the entire area if the spraying had not been done. The spraying consisted in the application of Standard White Rose Oil, with which calcium caseinate was used as an emulsifier, with a power sprayer. The results obtained from its application were satisfactory, since there was a great reduction in the number of scales, and the outbreak might possibly have been checked even if there had been no coccinellids present.

**An experiment in direct biotic control of a scale insect on pine,** L. W. Orr and R. C. Hall (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1087–1089*).—In work at the Minnesota Experiment Station the introduction of coccinellid beetles of the genus Hyperaspis in a Scotch pine area infested with *Toumeyella pini* King, resulted in a marked reduction in the scale population.

**Mortality of the gray citrus scale from sulfur dusts,** E. A. McGregor (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1066–1070*).—Data on the insecticidal action of finely divided sulfurs applied against the gray citrus scale in orchards over a period of three years are briefly summarized. It was found that when so timed as to act against the young crawlers, a program of three dustings gave marked mortality in the hot inland San Joaquin Valley.

**Citrus scale distribution in the Mediterranean Basin,** S. B. Freeborn (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1025–1031*).—The author reports upon the distribution of the important coccid pests of citrus in the Mediterranean Basin, with observations on the economic importance of and the ecological and administrative factors influencing distribution made during the course of a trip in 1930.

**Leaf tier damages celery,** R. Hutson (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 91–93, fig. 1*).—A brief practical account of the greenhouse leaf tyer, which during September, 1931, caused considerable loss to Michigan celery growers. In control work it was found that where pyrethrum dusts were carefully applied at the rate of 25 lbs. per acre, followed in 30 minutes by another application at the same rate, satisfactory control was obtained.

**Remarks on the genus Ellopia (order Lepidoptera, family Geometridae), with special reference to the oak looper, E. somniaria Hulst, and the hemlock looper, E. fervidaria Hubner,** W. J CHAMBERLIN (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1036–1041, pls. 2*).—In this contribution from the Oregon Experiment Station a report is made of studies of the life history of *E. somniaria* in the Willamette Valley of the State. *E. fervidaria*, which is a serious pest of coniferous trees, and *E. somniaria*, which defoliates oaks, are considered to be biological strains of a single species. The hemlock spanworm inflicts heavy damage to conifers in northeastern America, while *E. athasaria* Walk. does some damage to hemlock and other trees in Ohio. The decline in epidemic infestations of *E. somniaria* appears to be due largely to parasitism, a tachinid, a chalcid, a pteromalid, and three species of Ichneumonidae having been found to parasitize nearly 25 per cent of the caterpillars and pupae.

**Insect damages Chippewa County pea crop,** R. H. PETTIT (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 87–89, figs. 2*).—In reporting upon injury by the pea moth during the summer of 1930 to the pea crop in Chippewa County and to a lesser degree in Ontonagon and Delta Counties, in which district it has recently been introduced from eastern Canada, it is pointed out that fall plowing and crop rotation are the best control measures.

**Spraying to control the codling moth in southwestern Michigan,** F. SHERMAN, III (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1075–1077*).—Experiments conducted in southwestern Michigan are said to indicate that several summer brood sprays of lead arsenate may be necessary to control the codling moth satisfactorily. Sprays of oil with nicotine sulfate gave good results on an early variety, but were less satisfactory on later varieties. In all cases where oil with nicotine was used in the summer brood sprays, the arsenical residue on the fruit was greatly reduced. Oil sprays, where used alone for the summer brood larvae, were ineffective. Some oils, when used in combination with nicotine sulfate, may cause injury to the fruit.

**A four-year study of codling moth baits in New Mexico,** J. R. EYER (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 998–1001, fig. 1*).—The author reports upon tests made at the New Mexico Experiment Station of various sirup baits and aromatic esters with respect to their attractiveness to the codling moth for the period 1928 to 1931, inclusive. Work relating thereto has been noted (E. S. R., 65, p. 853).

Brer Rabbit sirup diluted with water at the rate of 1 to 10 proved to be the most attractive of all baits tested in the State. The addition of 0.2 per cent of sodium benzoate increases its attractiveness through retarding and lengthening fermentation. This is not as noticeable during the spring months as in summer when temperatures are higher. Malt sirup when used without yeast is moderately attractive. Of 35 esters tested, ethyl oxyhydrate, isobutyl phenyl acetate, and diphenyl oxide were the most attractive. They did not, however, exceed Brer Rabbit sirup bait in attractiveness, nor did they add materially to the attractiveness of this bait when placed in it directly or in Peterson evaporation cups. Commercially prepared extracts of the aroma of apple blossoms and apple fruit, or apple fruit flavors, were not attractive to the codling moth. Esters of malic acid were only slightly attractive, and esters of valerianic acid were not at all so.

**Manure piles and feed lots as sources of European corn borer reinfestation,** L. B. SCOTT (*U. S. Dept. Agr. Circ. 194 (1931), pp. 15, figs. 4*).—Following a brief introduction and a discussion of methods of investigation, the author reports observations in farm manure piles made at Silver Creek, N. Y., in 1927, 1928, and 1929; in farm manure piles at Toledo, Ohio, in 1928 and 1929; and in specially constructed manure piles at Silver Creek, N. Y., in 1927 and 1928 and check experiments in 1928–29. The work demonstrated that corn borer larvae migrate in large numbers from farm manure piles, that these larvae may migrate to a distance of 25 ft., and that the adults resulting from such larvae are fertile and capable of infesting the next crop of corn. This has led to the recommendation that farmers avoid placing infested material in manure piles, that all manure from piles containing infested material be cleanly plowed under early in the spring before larvae begin to migrate in large numbers, and that plant remnants be removed from barnyards and destroyed or buried.

In observations made at Toledo in the spring of 1929 on the survival of larvae in feed lots, in which 40 head of cattle and 35 hogs were fed in an inclosure of 60 by 80 ft., it was found that practically all of the larvae had been destroyed. "It appears that the number of larvae surviving in feed lots is so small that infested material may be placed in such feed lots and be left there with no treatment in addition to being trampled by animals. It is essential, however, that the trampling be thoroughly done and that no dry or unbroken sections of cornstalks be left on the surface of the feed lot. When all plant remnants are thoroughly mixed with manure by means of trampling, no other treatment need be given, and this control method is recommended as a means of disposing of infested material. There is no evidence to indicate that the time of trampling is an important factor, except that the trampling should be completed before the emergence of moths, which does not occur in this area before June 1. If it is found that the infested stalks have been insufficiently trampled and that they still contain living larvae, it is recommended that such material be completely plowed under before May 15."

**The chemotropic responses of the house fly, the green-bottle flies, and the black blowfly,** E. W. Laake, D. C. Parman, F. C. Bishopp, and R. C. Roark (*U. S. Dept. Agr., Tech. Bul. 270 (1931), pp. 11*).—The present contribution reports upon tests made at Dallas and Uvalde, Tex., with a view to determining the chemotropic responses of the house fly, *Lucilia* spp., and *Phormia regina* Meig. to a number of organic and inorganic materials alone and in combination. The details of 192 tests are presented in tabular form and briefly discussed.

"*Lucilia* spp. apparently are not so chemotropically sensitive as the other flies. It was noted that one species might be attracted by a material added to the bait whereas another is repelled by it. Pine-tar oils rank high in repellent value against all of the flies discussed herein. Only geraniol was found to increase the attractiveness of the bait for *P. regina*, bromoform made the bait more attractive for *Lucilia* spp., and seven other materials made it more attractive for *Musca domestica*. Clove oil and clove powder are used for protecting fresh meat at camps. Some of the materials have been used for repelling or destroying flies that were annoying at camps or in buildings. Other materials tested might be used in protecting bodies from flies in times of war or catastrophe."

**Possible future distribution and abundance of the Mediterranean fruit fly (Ceratitis capitata Wied.) in the United States,** H. J. Quayle (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1064–1066*).—In this contribution from the California Citrus Experiment Station an attempt is made to predict where the Mediterranean fruit fly may thrive in the United States and how serious it may be as a pest, as based upon conditions where the pest now occurs.

A circular on the Mediterranean and other fruit flies by the author has been noted (E. S. R., 61, p. 659).

**The introduction of the tachinid parasites of the European earwig in Oregon,** D. C. MOTE (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 948–956*).—This contribution from the Oregon Experiment Station deals with the progress of work with two European species of Tachinidae, *Digonichaeta setipennis* Fall. and *Rhacodineura antiqua* Meig., parasites of the European earwig which were introduced into the State by the station in cooperation with the U. S. D. A. Bureau of Entomology beginning in 1924 (E. S. R., 55, p. 658). The paper presents a brief statement of the organization and administration of the project, a summary of the introductions, results of the production of the parasites in captivity, their colonization, and the present status of the project.

**The biology of Digonichaeta setipennis Fall., a tachinid parasite of the European earwig, as observed primarily under western Oregon conditions,** D. C. MOTE, H. C. STEARNS, and R. E. DIMICK (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 957–961*).—This contribution from the Oregon Experiment Station deals with the biology of one of the two tachinid parasites of the European earwig noted above.

**Hand-parasitizing the European earwig with the larvae of Digonichaeta setipennis Fall.,** R. E. DIMICK (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 962–964*).—In this further contribution from the Oregon Experiment Station on the tachinid parasite noted above, the author describes a method of parasitizing the European earwig by hand. This consists in placing the parasitic larvae on earwigs which are held either mechanically or anesthetized by chloroform.

**The blueberry maggot and its control in eastern Maine,** F. H. LATHROP and L. C. MCALISTER, JR. (*U. S. Dept. Agr. Circ. 196 (1931), pp. 14, figs. 9*).—In reporting further upon studies of the blueberry maggot (E. S. R., 64, p. 58), it is pointed out that infested blueberries may be washed in the canning factory to reduce the number of maggots. The washing process is inconvenient and expensive, however, and field control measures are usually necessary. "Regular care of blueberry land is important in the control of the blueberry maggot, but it does not seem advisable to rely on cultural practices alone to control the maggot. Dusting blueberry land with calcium arsenate has proved to be an effective and practical method of combating the maggot, both in experimental tests and in the hands of commercial blueberry growers. A high grade calcium arsenate insecticidal dust should be applied at the rate of 6 to 7 lbs. per acre at each application. Two applications of dust are recommended. During normal seasons in the Cherryfield-Columbia Falls section of Washington County, Maine, the first application should be made between July 13 and 20. The second application should be made from 7 to 10 days after the first. No application should be made later than two weeks before the fruit is to be harvested. If the dusting is done carefully according to recommendations, and is followed by normal rainfall, there should be no excessive residue on the berries at picking time. In doubtful cases the berries should be given a light washing in the factory before canning. As a pest of fresh fruit the maggot may be combated by a program of frequent clean picking on small areas of land known to be comparatively free from blueberry maggots."

**Index to malaria literature, IV, 1929** [trans. title], G. TEGONI and B. A. WILLIAMS (*Riv. Malariol., 10 (1931), Sup., pp. 108*).—Part 6 of this bibliography (pp. 36–46) deals with the literature on anopheline mosquitoes.

**Sex differentiation of the spotted cucumber beetle,** C. E. SMITH and N. ALLEN (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1077–1079*).—This discussion of a prominent external character used in determining the sex of the spotted cucumber beetle is contributed by the U. S. D. A. Bureau of Entomology and the Louisiana Experiment Stations, cooperatively.

**[Injury to nursery stock by Phytorus pinguis]**, J. GUERRERO (*Guam Sta. Rpt. 1930, p. 17*).—The damage caused by a beetle, *P. pinguis*, which devoured young shoots of various seedlings in the nursery, was materially reduced by the application of a spray combination of lead arsenate and lime.

**A method of trapping the confused flour beetle, Tribolium confusum Duval**, J. D. DECOURSEY (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1079–1081*).—Corrugated paper containing wheat flour as an attrahent was found to be an efficient trap for *T. confusum* in shelled corn. During 961 trapping hours, or 40 trapping days, 85,500 beetles were captured in traps in moth rooms where large numbers of grain-infesting insects were present. The average number of beetles captured in traps 6.5 by 5.5 in. in size during 72-hour exposure periods was 46.4.

**Imported rose stem-girdler attacks roses**, E. I. MCDANIEL (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 89–91, figs. 3*).—In briefly referring to the injury caused by *Agrilus communis rubicola*, it is pointed out that the only practical method of control consists in cutting and burning all infested rose canes before the beetle adults emerge in the spring.

**The reproductivity of the bean weevil (Mylabris obtectus Say) as affected by the vapor of ethylene oxide**, G. W. HERRICK and W. R. HORSFALL (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1084–1086*).—The authors have found that short exposures to ethylene oxide appear to stimulate hatching of the eggs of *M. obtectus*. With more protracted exposures the number of eggs laid and the number hatching decreased, the time for production of viable eggs and the mean periods of oviposition and hatching were lengthened, and the mean longevity of the adults was as long or lengthened.

**A new curculio jarring sheet**, O. I. SNAPP and J. R. THOMSON (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 1082, 1083, fig. 1*).—A description is given of a new sheet used in jarring the plum curculio which has a number of advantages over any sheet heretofore used.

**Some hibernation habits of the pea weevil in relation to its control**, A. O. LARSON and F. G. HINMAN (*Jour. Econ. Ent., 24 (1931), No. 5, pp. 965–968, pls. 2*).—The authors report that pea weevils which emerged from the shattered peas left on the ground have been found hibernating in previously unrecorded places such as in moss, liverworts, and lichens attached to the trunks and branches of trees. It is pointed out that the presence or absence of suitable hibernating quarters may be a determining factor in the amount of infestation in different isolated pea fields.

**The garden centipede**, F. H. WYMORE (*California Sta. Bul. 518 (1931), pp. 22, figs. 12*).—This is an account of a centipede-like animal, *Scutigerella immaculata* (Newp.), a pest of various crops in 14 counties in California, which does injury to plants growing out-of-doors during the spring and summer months. It attacks the tender underground portion of practically all kinds of plants, eating numerous small holes or pits into the stems and roots and causing wilting and often the death of the host. It is thought that infested soil carried on farm tools or on the roots of plants may be responsible for the spread of the pest in the fields. While the garden centipede is not likely to be found in the main mass of a manure heap, it is commonly found in the edges where the manure is well decayed and vegetation may be growing. Much care should, therefore, be exercised when moving manure to the fields so as not to gather up the infested material.

Flooding has proved the only practical method for controlling the garden centipede in asparagus fields. Levees for holding the water should be substantially constructed and so placed that all portions of the field may be covered to a depth of 1 ft. or more for from 2 to 3 weeks. The proper time for flooding is during the winter when the plants are in a dormant condition. All infested levees or small newly-discovered field infestations should be treated with carbon disulfide at the rate of 2.5 oz. to a hole, in holes 12 in. deep and 18 in. apart each way. Soil fumigants have not proved practical as a general field treatment for its control.

**Red spider control in greenhouses,** C. C. COMPTON (*Jour. Econ. Ent.*, *24* (*1931*), *No. 5*, *pp. 1094–1097*).—Experiments conducted have shown that the addition of 1.5 per cent Penetrol greatly increased the effectiveness of Derrisol as an arachnicide. Derrisol 1:400 plus Penetrol 1:200 has been found to be effective against red spider eggs as well as the mites, and commercial control has been obtained in a number of cases by making two applications of this mixture eight days apart.

**Refrigeration of Trichogramma minutum Riley and other notes,** A. PETERSON (*Jour. Econ. Ent.*, *24* (*1931*), *No. 5*, *pp. 1070–1074*).—In mass production of the egg parasite *T. minutum*, the problem of keeping the parasites alive during the season of the year when there is no need for large numbers of adults is one that has to be solved. The author has found bagworm eggs to be fairly satisfactory for this purpose for from 40 days to 6 months at temperatures approximating 40° F. The sex ratio was found to be unchanged. The form with yellow females was found to live longer and to be more prolific in bagworm eggs than was the form with dark colored females.

## ANIMAL PRODUCTION

**Statistical analysis of comparative feeding trial data,** E. W. CRAMPTON (*Sci. Agr.*, *11* (*1931*), *No. 5*, *pp. 281–285*).—In this paper from the Macdonald College, Canada, an explanation of the use of Student's method of paired experiments in the conduct of feeding trials is given.

**Oil cakes and extracted meals,** H. E. WOODMAN (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 11* (*1931*), *pp. VIII+32*).—This bulletin deals with the composition, feeding value, and uses of common oil cakes and meals as supplements to carbohydrate-rich, home-grown feeds for livestock.

**Inspection of commercial feedstuffs,** P. H. SMITH ET AL. (*Massachusetts Sta. Control Ser. Bul. 59* (*1931*), *pp. 49*).—This is the usual report of the official chemical and microscopic analyses of 1,591 samples of feeding stuffs intended for livestock and poultry consumption, collected during the year ended September 1, 1931 (E. S. R., 65, p. 60).

**[Investigations of frozen meat]** (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1929*, *pp. 10–43*, *pls. 2*, *figs. 13*).—The following papers were presented under the section on meats in the report of the director of food investigation: The Transport of New Zealand Frozen Mutton and Lamb: Loss of Bloom, by T. Moran (pp. 10–12); The Factor of Quality in the Freezing of Meat, by T. Moran and E. C. Smith (pp. 12, 13); The Physiology of Rigor Mortis, by E. C. Smith (pp. 13–15); The Freezing of Tissues, by E. C. Smith, T. Moran, and J. R. Vickery (pp. 15–26); Changes in Muscle-pigments, by J. Brooks (pp. 27–30); Changes in Fats during Storage, by C. H. Lea et al. (pp. 30–40); and Bacteriology, by R. B. Haines (pp. 40–43).

**Ergot on barley does not harm cattle,** R. E. HORWOOD and G. W. PUTNAM (*Michigan Sta. Quart. Bul.*, *14* (*1931*), *No. 2*, *pp. 84*, *85*).—In this test three pregnant cows were fed all the mixed hay and sunflower silage they would consume. In addition they received 1 lb. of a grain mixture composed of 500 lbs. of ground barley, 200 lbs. of cottonseed meal, and 1 per cent of salt for each

3.5 lbs. of milk produced. The barley used contained what appeared to be a large amount of ergot in the field (1 per cent stem count). The cows were pronounced free from all effects of ergot and in excellent health from time to time throughout the test. Strong living calves were produced, and the cows cleaned normally.

**Matai tati disease,** C. W. Edwards (*Guam Sta. Rpt. 1930, pp. 5, 6, figs. 2*).—Investigations seemed to indicate that matai tati disease of cattle could be prevented by feeding bone meal. The remedy, however, was not applicable to the carabao because of the reluctance of the affected animals to eat the meal. The disease attacked cattle pastured wholly on the savannas or red clay uplands of the islands and occurred more frequently in cows in milk than in bulls, young heifers, and dry cows.

**[Feeding tests with swine],** C. W. Edwards (*Guam Sta. Rpt. 1930, pp. 6, 7*).—A ration of 2 parts by weight of cooked seedless breadfruit and 1 part of coconut meal produced better gains in 12-weeks-old pigs than a ration of 2 parts of breadfruit and 1 part of fresh coconut. Both lots made unusually low gains, and the results indicate that neither of these combinations was satisfactory for pigs of the age used.

In a second test a lot of pigs about 5 months old was fed a ration of 2 parts of native squash and 1 part of coconut meal; a second lot, 2 parts of native squash and 1 part of fresh coconut; and a third lot, squash only. The pigs in the third lot failed to gain, and the test was discontinued after 15 days. The other lots were fed for 60 days, during which time the respective lots made average daily gains of 0.6 and 0.5 lb. per head.

**Dry lot rations for fattening hogs,** E. G. Godbey and L. V. Starkey (*South Carolina Sta. Bul. 281 (1931), pp. 15*).—This series of studies (E. S. R., 64, p. 663) was continued, and it was found that equal parts of fish meal and soybean meal or cottonseed meal produced faster and more economical gains than fish meal alone when used as protein supplements to corn for pigs in dry lot. Fish meal and peanut meal produced faster gains than fish meal alone, but the gains were not as economical. The combinations of soybean meal or cottonseed meal and fish meal were practically equal in feeding value and in economy of gains produced. The mixtures containing soybean meal or cottonseed meal produced more rapid and economical gains than the one containing peanut meal. The fish meal-soybean meal mixture produced faster and cheaper gains than tankage. Both the soybean meal and cottonseed meal mixtures produced more rapid gains when fed free choice than when hand-fed, and the free choice method of feeding also produced cheaper gains when cottonseed meal was used but more expensive gains when soybean meal was used.

In this work a 7 per cent grade of cottonseed meal was more economical and produced faster gains than a 9 per cent grade. Adding 5 per cent of wheat bran to a ration of corn, soybean meal, and fish meal reduced the rate of gain and increased the cost of gains 5.5 per cent. Based on the availability and price of feeds and on the rate and economy of gains, the most efficient ration in this study consisted of equal parts of cottonseed meal and fish meal fed free choice with corn.

**Improving corn and tankage for pigs not on pasture,** W. L. Robison (*Ohio Sta. Bul. 488 (1931), pp. 41*).—The results of an entire series of tests which have been previously noted (E. S. R., 57, p. 171; 60, pp. 171, 461; 61, p. 463; 62, p. 65; and 63, p. 61) are reported in this bulletin. The study was undertaken to determine methods for improving a ration of corn and tankage for winter or dry lot feeding.

**The value of fish meal rich and poor in fat for swine feeding** [trans. title], J. C. DE RUYTER DE WILDT (*Ver. Exploit. Proefzuivelboerderij Hoorn, Verslag 1928, pp. 59–96, fig. 1; Ger. abs., pp. 81–83; Eng. abs., pp. 84–87*).—In a study at the agricultural experiment station of Hoorn, Netherlands, two trials were conducted with two lots of 12 pigs in each trial. A basal ration of ground corn, ground barley, and whey was fed to all pigs, and in addition one lot in each trial received 250 gm. of nonextracted fish meal and the other lot a like amount of fish meal extracted with trichorethylene at boiling temperature. The nonextracted meal contained from 2.65 to 9.31 per cent of fat and the extracted meal from 1.34 to 1.98 per cent. The pigs also received 10 gm. of calcium phosphate per head daily and fresh grass when available. Pigs averaging 80 lbs. per head were fed for 146 days in the first test and 94-lb. pigs for 112 days in the second test.

The pigs receiving the extracted meal made 2.73 kg. less growth in the first and 3.33 kg. less growth per head in the second test than those receiving the nonextracted meal. Using the results of both tests, it was found that the average daily gains were 25 gm. lower and the fat required to produce 1 kg. of gain 3.5 per cent higher when the extracted meal was fed. The fat-rich fish meal had no effect upon the smell or taste of the meat of the slaughtered animals.

**Protein changes in fish meal when fat has been extracted by trichlorethylene** [trans. title], J. C. DE RUYTER DE WILDT (*Ver. Exploit. Proefzuivelboerderij Hoorn, Verslag 1928, pp. 97–105; Ger. abs., p. 104; Eng. abs., p. 105*).—Continuing this work, it was found that extracting fish meal decreased the albuminoid content and increased the amido compounds. There was, however, no change in the digestibility of the albuminoids. These results showed that while extracting the fish meal broke down some of the protein substances, it did not change their digestibility.

**The value of dried sugar-beet pulp and molasses-sugar beet pulp in the nutrition of swine**, H. E. WOODMAN, A. N. DUCKHAM, and M. H. FRENCH (*Jour. Agr. Sci. [England], 19 (1929), No. 4, pp. 656–668*).—In a study undertaken at Cambridge University a digestion experiment was carried out with two pigs having an initial weight of 190 and 191 lbs., respectively. During the first feeding period the digestibility of a ration made up of fish meal, middlings, maize meal, and molasses beet pulp was determined, a second period was devoted to the measuring of the basal ration of fish meal, middlings, and maize meal, and a third period to the digestibility of the basal ration plus dried sugar beet pulp. A second phase of the study consisted of a feeding trial with three lots of pigs.

The results of the digestion trial showed that pigs were able to utilize dried sugar beet pulp and molasses sugar beet pulp about as well as ruminants were able to digest these feeds. However, the inclusion of sugar beet pulp in amounts equal to only one-sixth of the ration caused the mixed feeds to be very bulky after the usual soaking in water. This bulk prevented pigs from consuming as much feed as when no sugar beet pulp was fed, and the depressing effect on feed consumption was reflected in the rate of gains by the pigs in the feeding trials. The carcasses of the pigs receiving beet pulp graded lower than those of pigs on a ration which did not contain this feed. It is suggested that beet pulp could be used in rations for breeding stock or for pigs that were not being fattened rapidly.

**The value of whole sugar beet in the nutrition of swine**, H. E. WOODMAN, A. N. DUCKHAM, and M. H. FRENCH (*Jour. Agr. Sci. [England], 19 (1929),* *No. 4, pp. 669–676*).—Continuing the above study, similar digestion and feeding trials indicated that whole sugar beets, suitably grated, could be used to replace barley meal in the ration in amounts up to 25 per cent without affecting the value of the ration for the production of bacon. The substitution was made at the rate of 3.5 lbs. of beet for 1 lb. of barley meal.

**Powdered skimmilk for weanling pigs,** E. W. Crampton (*Sci. Agr., 11* (*1931*), *No. 6, pp. 347–350*).—In this study at Macdonald College, Canada, 10 pairs of pigs were fed individually for 32 days immediately following weaning. In all cases but one, the pair mates were also litter mates. The pigs in lot 1 received a meal mixture composed of 350 lbs. of ground corn, 350 lbs. of wheat middlings, and 300 lbs. of a protein-mineral supplement consisting of a mixture of tankage, linseed meal, fish meal, bone meal, ground limestone, salt, and ferric oxide. The ration in lot 2 was the same as above named except that a like amount of powdered skim milk replaced the protein-mineral supplement.

The pigs in lot 1 made an average daily gain of 1.42 lbs. per head and an average gain of 45.4 lbs. for each 100 lbs. of feed eaten. In lot 2 the average daily gains were 1.54 lbs. per head, and the pigs gained 50 lbs. for each 100 lbs. of feed consumed. There was an average "net difference" of 1.3 lbs. of gain per 100 lbs. of feed consumed in favor of the powdered skim milk. In this test powdered skim milk was 2.9 per cent more efficient for producing gains than the protein-mineral mixture.

**Curing pork on the farm,** L. R. Neel (*Tennessee Sta. Circ. 39* (*1931*), *pp. 4*).—Different methods of curing hams, shoulders, and bacon, and the value of each method, are described in this publication.

**Digestibility and nutritive value of various feeds for work horses** [trans. title], V. K. Ivankin (*Zap. Leningrad. Selsk. Khoz. Inst.* (*Mém. Inst. Agron. Léningrad*), *7* (*1929*), *No. 1, pp. 262–301; Eng. abs., p. 301*).—In digestion trials with horses at the Leningrad Agricultural Institute, it was found in determining the rate of digestibility of separate feeds in mixed rations that it was necessary to consider hay and oats as a fundamental feed. When part of the hay in a ration was replaced by straw, the digestibility of the oats was increased. Grinding grain was also found to increase its digestibility greatly.

**The formation of the hen's egg, I–IV,** V. S. Asmundson (*Sci. Agr., 11* (*1931*), *Nos. 9, pp. 590–606, figs. 3; 10, pp. 662–680, figs. 4; 11, pp. 775–788, fig. 1*).—The object of this investigation, part of which was carried out at the University of British Columbia, and part at the Wisconsin Experiment Station, was to study the normal functioning of the hen's oviduct and to determine how it could be influenced.

I. *Function of the parts of the oviduct.*—Before using in this study a record was made of a few eggs from each bird for length, four diameters at equator, color, photographic outline, weight, weight of yolk, and weight of fresh shell. After these records had been obtained operations were performed on various portions of the oviduct and uterus.

Eggs were obtained from four hens with fistulas to the outside, at or near the posterior end of the uterus. Of these eggs seven were as large as the eggs laid before the operation, two were similar in shape to normal eggs, and one had a complete normally pigmented shell. These results showed that the vagina does not take part in the formation of the eggs, and that the position of the uterus and its attachment to the ligaments has little if any influence on its muscular and secretory activity.

The eggs laid by a hen after nearly half of her isthmus had been removed were abnormal in shape and had a rough shell that was devoid of color, although the two shell membranes were present. These results showed that half the isthmus is capable of forming normal shell membranes, and that it influences the shape of the egg and the pigmentation of the shell.

In none of the observed cases did the removal of part of the oviduct bring about a reduction in the size of eggs. Observations on two eggs removed from the anterior part of the isthmus showed that the thin outer albumin is added after the egg leaves the albumin part. When left in albumin for 24 hours, 10 yolks increased in weight in each case, indicating that the yolk increases in weight while traversing the oviduct. Other observations indicated that the average time the egg remains in the uterus is longer than the 16 to 17 hours commonly estimated.

II. *Determination of the shape of the egg.*—In this phase of the study the measuers of shape considered were the length-breadth index and the absolute variation in breadth. Various operations were performed upon the isthmus and uterus of different hens.

That the isthmus influenced the shape of the egg was shown by the fact that after the anterior half of the isthmus was removed the eggs laid were more irregular in shape than the eggs laid before the operation. In addition the eggs laid by a hen whose isthmus was torn longitudinally and the tear closed with catgut sutures had characteristically wrinkled shells. Eggs removed from the uterus by means of a fistula had very little eggshell, but had the characteristic shape of normal eggs. Temporary ligation of the isthmus resulted in the laying of abnormally shaped eggs for a time, with a gradual return to approximately normal eggs.

The removal from the ventral side of the uterus of a pullet of a piece 2.5 by 1.1 cm. was followed by the laying of a few approximately normally shaped eggs, but later eggs were flattened on one side. Similar treatment of a hen except for the final removal of the portion of the uterus did not interfere with the laying of normally shaped eggs. Placing cotton at the sides of the uterus caused subsequent eggs to have thin-shelled depressions on one side, and later eggs had a depression reaching more or less around the egg.

The above results indicated that the general shape of the egg is determined by the amount of albumin secreted in the albumin part, by the caliber of the lumen of the albumin part and isthmus, and by the muscular activity of the walls of these parts.

III. *Determination of the size of the egg.*—In this phase of the study a statistical analysis was made of 707 eggs and their parts laid by 67 birds before they were used for experimental purposes.

The mean total weight of the eggs and their parts were yolk 16.1 gm., albumin 31.52, shell 5.63, and total weight 53.64 gm. The relative variability in the weight of the parts of eggs as measured by the coefficient of variability was in inverse order to the weight. The weight of the egg was found to be positively correlated with the weight of each of its parts. The coefficients of correlation for egg weight to albumin, to shell, and to yolk were +0.899, +0.636, and+0.538, respectively. The thickness of the shell was closely correlated with weight of shell, +0.778, but was only slightly influenced by weight of egg, +0.18. The weight of yolk was not correlated with weight of shell, +0.091, and only slightly with weight of albumin, +0.197, but the weight of albumin and shell were positively correlated, +0.611. The correlations between the parts of the egg indicated that the weight of albumin and shell depended to only a limited extent on the weight of yolk. In one case an egg was laid that had the normal amount of albumin and shell, but the yolk weight was only 6.4 gm. as compared with 11.91 gm. for 5 eggs previously laid by the same hen.

A comparison of 15 bantam eggs with 60 eggs having yolks of the same weight showed less albumin than in ordinary eggs. The albumin content varied from 17.42 to 22.27 gm. for bantam eggs and from 24.45 to 34.93 gm. for normal eggs. This was interpreted to indicate that the amount of albumin secreted was to some extent dependent upon the size of the bird and also upon the size of the oviduct.

IV. *Abnormal types.*—In this phase of the investigation a study was made of abnormal eggs laid by the birds. Dwarf eggs were obtained from two hens that were actively ovulating. One hen laid seven such eggs, so spaced as to suggest that they resulted from normal ovulation, and an eighth egg containing a vitelline membrane. This bird was killed after laying the last dwarf egg, and yolk material was found in the body cavity, indicating that such eggs follow the ovulation of yolks that subsequently escape into the body cavity intact, or after breaking. A hen into whose oviduct an artificial yolk had previously been inserted laid three double-yolked eggs. It was believed that lowered physiologic tone of the oviduct due to the operation was the cause of these abnormal eggs, although the rate of ovulation was obviously higher than at other times. As the result of the insertion of an artificial yolk, a dwarf egg with an elongated stalk was laid by a hen. Two other eggs with elongated stalks but with normal yolks were laid by a hen that had been operated on twice and artificial yolks inserted. Such eggs were believed to be due to a displacement of a part of the albumin, caused by constriction in the oviduct or unusual physiologic activity.

These results show that the three processes that must take place so far as the oviduct is concerned before a normal egg can be completed are (1) the growth and preparation of the oviduct for secretion, (2) the oviduct must secrete, and (3) peristalsis or muscular activity must occur so that the yolk, or other mechanical stimulus to secretion, is moved through the lumen of the duct.

The last two processes normally occur together following the first, but variations in the functioning of the oviduct indicate that the secretory and muscular activities of the oviduct depend on different physiologic factors.

**Progressive poultry raising,** M. A. Jull (*Chicago: Armour's Livestock Bur., 1931, pp. [3]+222, pl. 1, figs. 93*).—This handbook deals with the breeding, feeding, and management of chickens, turkeys, ducks, and geese. In addition the preparation for marketing and methods of marketing poultry and poultry products are discussed.

**Rations for rabbits tested at college,** R. A. Conolly and C. G. Card (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 77–81*).—This test was undertaken to determine a simple ration for rabbits that would produce rapid gains at a low cost. Rations similar as to percentage of fiber, protein, total digestible nutrients, and minerals were fed to 9 lots of 2 head each from the time they were 6 to 13 weeks of age. Some of the rations were fed as dry mash and others as wet mash, while in other rations oats, barley, and bran were substituted for part of the corn, and in still others powdered milk was substituted for the gluten and oil meal in the basal ration.

The results showed that wet mash produced greater and more economical gains than dry mash. The rations which contained the larger amounts of oats, barley, and bran produced larger and cheaper gains than the basal ration, with a slight advantage for the barley. Increasing the milk content of the ration did not materially increase the gains, but did increase the cost of gains. An increase in the percentage of oats in the ration increased the rate and economy of gains. The most economical gains were made during the early part of the feeding period and gradually increased in cost as the period progressed. The dressing percentage of young rabbits was found to be between 50 and 55.

**A scrap book of mink raising,** R. G. Hodgson (*Toronto: Fur Trade Jour. Canada, 1931, pp. 337, figs. 71*).—This treatise is a collection of facts dealing with the feeding, breeding, management, and housing of minks.

## DAIRY FARMING—DAIRYING

**Study of home grown ration for milk production,** C. F. Huffman and G. A. Bowling (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 85, 86*).—To compare the relative values of a simple home grown ration and a complex ration for milk production, two lots of five cows each were fed by the double reversal method through four 30-day test periods. Both lots received alfalfa hay and corn silage. The complex grain mixture was made up of ground yellow corn, ground oats, wheat bran, cottonseed meal, linseed meal, salt, and steamed bone meal, while the home grown grain mixture consisted of ground oats and ground rolled oats, alfalfa leaf meal, and salt.

The cows consumed 108.11 lbs. more digestible crude protein and 39.07 lbs. more total digestible nutrients while on the complex ration than while on the home grown ration. On the home grown ration the cows produced 304.2 lbs. more milk and 8.98 lbs. less butterfat than on the complex ration. When converted to a 4 per cent milk basis, the complex ration gave a production of 23,669.99 lbs. and the home grown ration a production of 23,656.97 lbs. This difference in production was not significant. The body weights of the animals were not affected by either ration.

**Wheat as a substitute for corn in the dairy ration,** C. C. Hayden and C. F. Monroe (*Ohio Sta. Bimo. Bul. 153 (1931), pp. 203–208, figs. 2*).—In this study eight Jersey and four Holstein cows were divided into two nearly equal groups and, aside from the grain ration, received the same treatment. One lot was fed a grain mixture of corn, oats, bran, and linseed meal 4:3:1:1, while in the grain mixture of the second lot wheat replaced 75 per cent of the corn. The two groups were fed in the above manner for 75 days, the rations were then reversed, and the feeding was continued for another 75 days. At the end of the period eight cows equally divided between the lots were still milking well, so the rations were again reversed for another 75 days. A group of 11 cows in various stages of lactation were fed for 7 months on a grain ration of wheat, oats, bran, and linseed meal 4:3:1:2 with mixed hay as the roughage.

It was found that wheat and corn were practically equal in feeding value and palatability. There was a slight advantage in gains in live weight in favor of the corn ration, but the milk produced on the wheat ration was somewhat higher in butterfat content. The cows fed for 7 months on wheat showed no ill effects due to the ration.

**Increasing the vitamin D potency of cow's milk by the daily feeding of irradiated yeast or irradiated ergosterol,** B. H. Thomas and F. L. MacLeod (*Science, 73 (1931), No. 1901, pp. 618–620*).—A group of Holstein cows was divided into 7 lots of 3 head each, the lots being made up of cows producing approximately the same amount of milk. A basal ration of alfalfa meal, corn silage, beet pulp, and grain mixture was fed to all lots through a 3-months' preliminary feeding period and an experimental feeding period of 4 weeks. The cows were confined indoors during the entire experiment except when exercised at night in lots free of vegetation. During the experimental periods the cows in lots 2, 3, and 4 received 10,000, 30,000, and 60,000 rat units each per day, respectively, of vitamin D as irradiated yeast, while those in lots 5, 6, and 7 received 15,000, 45,000, and 135,000 rat units each per day, respectively, of vitamin D as irradiated ergosterol dissolved in relatively small quantities of corn oil.

At the end of the experimental feeding period equal quantities of milk were collected from each cow for 3 successive days, and the milk from each lot was pooled. The butterfat was separated from the milk and filtered at a low temperature to free it from curd, water, and salts. The fats from the various lots were tested for their vitamin D potencies by feeding them during a 10-day period to rachitic rats. Line tests were made on the radii, ulnae, and tibiae of all the rats, and the relative values of the different fats were judged.

The results showed that the butterfats from lots 2, 3, and 4 were approximately 2, 8, and 16 times, respectively, as potent for vitamin D as the butterfat from the control lot. Likewise the fats from lots 5, 6, and 7 were approximately 2, 4, and 16 times as potent in vitamin D as the fats from the control lot.

**A determination of the blood and plasma volume of dairy cattle,** C. W. Turner and H. A. Herman (*Missouri Sta. Research Bul. 159 (1931), pp. 61, figs. 16*).—In this study the dye injection method for determining plasma volume and blood volume was adapted to dairy cattle, and approximately 120 determinations were made on growing dairy cattle, mature nonlactating, and mature lactating cows.

In 54 determinations with growing animals weighing from 200 to 900 lbs., the plasma averaged 3.5 per cent and the blood 5.81 per cent of the total weight of the animal. With nonlactating cows 24 determinations showed an average of 3.78 per cent of plasma and 6.38 per cent of blood by weight. The 41 determinations with lactating cows showed an average plasma content of 4.92 per cent and of blood 8.11 per cent of the total body weight. The mature cows were found to average approximately 7,768 cc. of blood per square meter of body surface as compared with 4,035 cc. per square meter for growing dairy cattle.

Grouping all animals, the increase in blood volume with weight was found to be an exponential form represented by the equation $B = 6200e^{0.0014845W}$, in which $B$ is the blood volume in cubic centimeters, $e$ the base of natural logarithms, and $W$ the body weight in pounds.

A comparison of the dye injection and "drain out" methods of determining blood volume showed the former to give values 47 per cent higher for lactating and 40 per cent higher for nonlactating cows of similar weight. The plasma constituted from 55 to 65 per cent of the total blood volume of the dairy animal.

**The hemoglobin and total phosphorus in the blood of cows and bulls,** C. M. McCay (*Jour. Dairy Sci., 14 (1931), No. 4, pp. 373–378*).—In a study at the New York Cornell Experiment Station, it was found that the blood of the normal cow contained 10.9±0.86 gm. of hemoglobin per 100 cc. of blood. The blood of mature bulls contained 12.8±0.8 gm. per 100 cc. There was no relation between the hemoglobin content of cows' blood and such factors as breed, milk production, fat production, and the prolongation of the lactation period. There was no change in hemoglobin content of the blood that could be related to the period of gestation or lactation. No differences were found in the total phosphorus, iron, or hemoglobin in the blood of 74 cows at the close of the winter months and after 2 months on pasture. Feeding protein at 3 levels over an 18-months period showed no effect on the hemoglobin, iron, or total phosphorus content of the blood of lactating cows.

**Body pattern as related to mammary gland secretion,** J. W. Gowen (*Natl. Acad. Sci. Proc., 17 (1931), No. 9, pp. 518–523, figs. 3*).—Based on eight body measurements collected from about 6,000 Jersey cows by the American

Jersey Cattle Club, a study was made of the relation of body form to milk secretion. The results showed that two items of body pattern, weight and wedge-shaped form when viewed from the front, were to a limited degree indicative of the amount of milk a cow will secrete. The correlations for these measurements had a significance comparable to those respectively for the milk yields between half-sisters and single cousins. None of the other measurements had any significant correlations. The concentration of butterfat in the milk was not indicated by any of the measurements.

**Dairy bacteriology,** [S.] ORLA-JENSEN, trans. by P. S. ARUP (*Philadelphia: P. Blakiston's Son & Co., 1931, 2. Eng. ed.,* [*rev. and enl.*], *pp. X+198, figs. 67*).—This is a revision of the treatise previously noted (E. S. R., 45, p. 880).

**The rate of chemical change in milk brought about by certain lactic acid streptococci,** C. D. KELLY (*New York State Sta. Tech. Bul. 184* (*1931*), *pp. 15, figs. 2*).—This study was undertaken to determine the chemical changes taking place in milk inoculated with *Streptococcus lactis* and *S. cremoris* and incubated for from 1 to 2 months. Skim milk containing 3 per cent of calcium carbonate was sterilized and used as the cultural medium. During the incubation period samples were taken at increasing intervals and tested for sugar and various nitrogen fractions. Duplications were carried out with skim milk without the calcium carbonate.

It was found that the milk sugar disappeared rapidly during the first 18 hours, after which the rate of decrease was somewhat slower. When calcium carbonate was present the destruction of sugar was greater than when it was absent. The nitrogen changes progressed in a uniform manner whether calcium carbonate was added or not, but proteolysis was greater when it was present. This difference, like the difference in fermentation of sugar, was probably due to an accumulation of hydrogen ions. When the chalk milk cultures were shaken once a day to insure mixing, the accumulation of unneutralized lactic acid was not sufficient to affect materially the results of the nitrogen tests.

When the two lactic acid organisms were compared with a commercial starter, it was found that *S. cremoris* and the starter produced about the same amount of amino nitrogen and that *S. lactis* produced less amino nitrogen than either of the above organisms.

**Studies on the viability of L. acidophilus in "acidophilus milk,"** W. L. KULP (*Amer. Jour. Pub. Health, 21* (*1931*), *No. 8, pp. 873–883*).—In this study at the Connecticut Storrs Experiment Station it was found that from the standpoint of palatability of *Lactobacillus acidophilus* milk the continued life of the organism in storage depends upon initial acidity or some related metabolic substance and storage temperature, assuming that there is a minimum of contaminating growth. For satisfactory viability for from 2 days to 1 week, commercial acidophilus milk may be stored at 5° C. (41° F.) when there is an acidity of 0.65 per cent at bottling time. When satisfactory viability for more than 1 week is desired, it is necessary that the number of foreign bacteria remain at a negligible figure, excessive acidity must be avoided, and storage temperature should range from 12 to 16° for milk having an initial acidity of 0.65 per cent.

## VETERINARY MEDICINE

[**Contributions presented at the Eleventh International Veterinary Congress, London, 1930**] (*11. Internatl. Vet. Cong., London, 1930, Rpts., vols. 2, pp. VII+397, figs. 3; 3, pp. X+926, pls. 9, figs. 13*).—The contributions presented at the general and sectional meetings, respectively, of the congress are given in English, French, or German, with abstracts in the two remaining languages, as follows:

*Vol. II.*—Foot-and-Mouth Disease, by W. H. Andrews (pp. 1–17); Foot-and-Mouth Disease: Plurality of Viruses, Immunization, Disinfection, by J. Lignières (pp. 18–36); Foot-and-Mouth Disease, by O. Waldman (pp. 37–59); Tuberculosis, by A. Ascoli (pp. 61–81); Vaccination against Tuberculosis, by C. Guérin (pp. 82–103); A Comparative Study of Vaccination with Living Tubercle Bacilli and with Special Reference to B. C. G., by E. A. Watson (pp. 104–132); Infectious Abortion of Cattle, Swine, and Sheep in the United States, by W. E. Cotton (pp. 133–150); Infectious Abortion of Cattle, Sheep, and Swine, by H. Holth (pp. 151–167); Infectious Abortion (Bang) in Swine, by A. Uranov and B. Bohl (pp. 168–171); Contagious Abortion in Cattle, Sheep, and Pigs, by W. Zwick (pp. 172–199); The Relationship of Veterinary Science to Animal Husbandry, by M. V. A. Hruza (pp. 201–223); The Relationship of the Veterinary Surgeon to Animal Husbandry, by S. Markowski (pp. 224–233); The Relationship of the Veterinary Surgeon to Animal Husbandry, by J. Share-Jones (pp. 234–256); Veterinary Science in Relation to Public Health, with Special Reference to the Production and Distribution of Meat, by R. von Ostertag (pp. 257–276); On the Principles (Both Administrative and Scientific) of a Meat-Inspection Law, also with Reference to International Conditions, by H. C. L. E. Berger and H. S. Frenkel (pp. 277–296; Veterinary Science in Relation to Public Health, with Special Reference to the Production and Distribution of Milk, by A. Gofton (pp. 297–317); Veterinary Science and Milk Hygiene, by C. F. van Oijen (pp. 318–327); Veterinary Science in Relation to Public Health, with Special Reference to the Production and Distribution of Milk, by R. von Ostertag (pp. 328–343); On the Percentage of *B. abortus* in the Milk of Cows That Have Aborted in Consequence of Infection with *B. abortus* Bang, by S. Wall (pp. 344–358); Legal Definitions Regarding the Practice of Veterinary Medicine, by M. Bürgi (pp. 359–375); The Law Governing the Practice of Veterinary Medicine and Surgery, by E. Leclainche (pp. 376–381); and The Law Governing the Practice of Veterinary Medicine and Surgery, by C. Sanz Egaña (pp. 382–397).

*Vol. III.*—The Variolas of the Domesticated Animals, by J. Bridré (pp. 1–21); On So-called Spontaneous Cow-Pox, by H. S. Frenkel (pp. 22–28); Variola in Domestic Animals: Contagious Pustular Dermatitis of the Sheep and Goat, by R. E. Glover (pp. 29–44); Anthrax: The Prevention of Its Dissemination through the Medium of Animal Products, by Müssemeier (pp. 45–65); The Control of Dissemination of Anthrax by Animal Products, by F. Fischoeder (pp. 66–75); Swine Fever (Diagnosis and Inoculation), by W. Geiger (pp. 76–94); Swine Fever (Diagnosis and Inoculation), by W. Nusshag (pp. 95–110); Control of Swine Fever by Immunization, by M. Dorset (pp. 111–118); Protective Inoculation of Domesticated Animals against Rabies, by A. Aujeszky (pp. 119–139); Rabies (Vaccination), by G. Finzi (pp. 140–156); Etiology of and Inoculation against Distemper, by W. Hinz (pp. 157–175); Distemper (Etiology and Vaccination), by H. Carré (pp. 176–183); Dog Distemper (Etiology and Vaccination), by G. W. Dunkin (pp. 184–198); Blackleg (Vaccination), by T. J. Bosworth (pp. 199–214); Active Immunisation against Blackquarter, by P. Rinjard (pp. 215–235); The Standardization of Biological Products, by A. Eichhorn (pp. 236–248); Standardisation of Biological Products (Sera, Vaccine, and Diagnostic Agents), by G. Flueckiger (pp. 249–258); Standardization of Veterinary Biologics in the United States, by J. R. Mohler (pp. 259–271); The Use of Drugs in the Treatment of Diseases Caused by Nematode and Trematode Worms, by E. L. Taylor (pp. 273–290); The Use of Drugs in the Treatment of Diseases Caused by Nematode and Trematode Worms, by M. C. Hall (pp. 291–301); Tests of the Anthelmintic Action of Certain Drugs on Nematode Worms in Animals, by R. E. Schulz (pp. 302–305): The Nature of Milk Fever, by J. R. Greig (pp. 306–329); Milk Fever, by P. A. Fish (pp. 330–350); The Graphic Representation of the Movements of the Uterus—Normal, and Strengthened or Weakened by Drugs—in Living Bovines during the Period of Involution, by F. Benesch (pp. 351–370); Prophylaxis and Therapy of Sterility in Cows, by W. Frei (pp. 371–386); Sterility—Its Prophylaxis and Treatment, by R. L. Conklin (pp. 387–408); Sterility in Cattle, by J. Wester (pp. 409–421); Acute Mastitis, by M. Klimmer (pp. 422–442); Latent Infection in Mastitis, by W. Steck (pp. 443–451); Bovine Mastitis, by F. C. Minett (pp. 452–470); Prevention of Diseases of the New-born, by H. Miessner (pp. 471–487); *Bacterium viscosum equi* (Adsersen) in Suckling Pigs and Its Relation to *Bacillus polymorphus suis* (Degen) in Focal Interstitial Nephritis in Swine: A Contribution to Our Knowledge of Diseases in the New-born in Swine, by H. Magnusson (pp. 488–510); Reflexions on the Diseases of the New-born, by L. Van Es (pp. 511–523); Theileriases, by K. F. Meyer (pp. 525–538); Theileriases, by P. J. du Toit (pp. 539–573); The Theileriases, by W. L. Yakimoff (pp. 574–599); The Control of Trypanosomiasis in the Dutch Indies, by C. Bubberman (pp. 600–613); Control of Animal Trypanosomiasis, by H. E. Hornby (pp. 614–636); Rinderpest (Prophylaxis), by W. Kearney (pp. 637–655); The Prophylaxis of Cattle Plague, by M. G. Curasson (pp. 656–673); Fowl Pox, by T. M. Doyle (pp. 675–691); Fowl-Pox and Coryza, by J. R. Beach (pp. 692–704); Fowl Typhoid and Bacillary White Diarrhoea, by F. R. Beaudette (pp. 705–723); Fowl Typhoid and Bacillary White Diarrhoea, by R. Manninger (pp. 724–740); Bacillary White Diarrhoea and Fowl Typhoid, by L. Panisset (pp. 741–755); Bacillary White Diarrhoea and Fowl Typhoid, by J. P. Rice (pp. 756–771); Immunisation against Fowl Plague, by C. Truche (pp. 772–784); The Treatment of Parasitic Diseases, by E. A. R. F. Baudet (pp. 785–800); The Treatment of Parasitic Diseases of Poultry, by J. Lahaye (pp. 801–814); Observations on the Accepted Theory of Heredity and in Its Relation to Animal Husbandry, by K. Keller (pp. 815–833); Genetics Applied to Animal Husbandry, by A. Pirocchi (pp. 834–847); Deficiency Diseases, by V. Stang (pp. 848–870); Deficiency Diseases, by J. Marek and O. Wellmann (pp. 871–895); Scientific Feeding of Animals, by P. Dechambre and E. Letard (pp. 896–907); and The Scientific Principles of Nutrition, with Particular Reference to Percentage Calf Crop in Range Herds, by G. H. Hart (pp. 908–926).

**Compendium of pathological anatomy for veterinarians,** T. KITT (*Grundriss der Pathologischen Anatomie für Tierärzte und Studierende der Tiermedizin. Stuttgart: Ferdinand Enke, 1931, pp. VII+349, pls. 8*).—Included in this work is a section dealing with some of the more important diseases of livestock (pp. 327–341).

**Annual report of the veterinary department for the year ended 31st December, 1930,** W. F. POULTON ET AL. (*Uganda Vet. Dept. Ann. Rpt. 1930, pp. 26, pl. 1*).—This report includes an account of the occurrence of and work with the more important diseases of livestock during the year.

**[Control work with animal diseases in the Philippine Islands],** S. YOUNGBERG (*Philippine Bur. Agr. Ann. Rpt., 28 (1928), pp. 81–90, pls. 3*).—Brief accounts are given of the control work with diseases of livestock, particularly that relating to rinderpest.

**Borna disease of the equine and grass tetany of the bovine [trans. title],** B. SJOLLEMA and L. SEEKLES (*Tijdschr. Diergeneesk., 58 (1931), No. 15, pp. 809–812; Ger., Eng., Fr. abs., pp. 811, 812*).—In an examination made of the blood of a horse suffering from Borna disease it was found that a most important symptom of grass tetany of the bovine, namely, the characteristic disturbance in the mineral equilibrium of the blood serum, did not occur in Borna disease. Further, the instantaneous curative effect of an intravenous injection of calcium chloride in grass tetany has shown the supposedly infectious origin to be quite improbable.

**Actinomycosis: A clinical, pathological, and bacteriological study,** H. P. Jacobson (*Med. Jour. and Rec., 132 (1930), Nos. 7, pp. 342–346; 8, pp. 379–381; 9, pp. 431–434*).—This account of actinomycosis is accompanied by illustrative case reports.

**Report of committee on communicable diseases affecting man—their relation to public milk supplies,** H. N. Parker (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 19 (1930), pp. 59–67*).—This discussion includes an account of the occurrence of anaplasmosis among herds of cattle in Florida, which, as is pointed out, is not transmissible to man.

**Atoxic botulism toxin (botulism toxoid, botulism anatoxin),** R. Graham, E. A. Tunnicliff, and E. C. McCulloch (*Ill. State Acad. Sci. Trans., 21 (1928), pp. 39–45*).—The authors found that if formalin (0.3 to 0.6 per cent) is added to filtered or unfiltered liquid cultures of *Clostridium botulinum* B and C, upon incubating one or more weeks at 37 to 42° C. they become relatively atoxic. A single subcutaneous injection of 1 to 3 cc. atoxic *C. botulinum* B and C toxins possesses immunizing value in guinea pigs. Horses and mules were not protected by single injections of *C. botulinum* B and C toxoids (20 and 30 cc.), but two injections a week apart protected against the unaltered toxins. The details of the study are presented in tables.

**Brucella abortus of bovine, porcine, and equine origin,** W. N. Plastridge and J. G. McAlpine (*Jour. Infect. Diseases, 49 (1931), No. 2, pp. 127–134*).—This is a report of studies at the Connecticut Storrs Experiment Station in continuation of those noted (E. S. R., 64, p. 558).

"One hundred and thirty-six strains of *B. abortus* of bovine, porcine, and equine origin were identified by the dextrose utilization method of McAlpine and Slanetz [E. S. R., 60, p. 267] and by Huddleson's dye plate method [E. S. R., 62, p. 75]. Eight of 60 strains of bovine origin isolated in the United States were found to be of the porcine, and 52 of the bovine, type. Of 50 strains of bovine origin isolated in Europe, 48 were found to be of the bovine type, while 2 appeared to be of intermediate types. All of the 22 strains of *B. abortus* of porcine origin utilized appreciable amount of dextrose and behaved as the porcine type on the dye plates. Four strains of equine origin proved to be of the bovine type of *B. abortus*."

**The gaseous requirements of Br. abortus (bovine type),** G. S. Wilson (*Brit. Jour. Expt. Path., 12 (1931), No. 2, pp. 88–92*).—The author's studies have led to the following conclusions:

"The bovine type of *Br*[*ucella*] *abortus* requires both oxygen and carbon dioxide for its development. The optimal concentrations of these two gases are 20 per cent oxygen and 5 to 10 per cent carbon dioxide, the remainder of the atmosphere being constituted by some inert gas such as nitrogen or hydrogen. Contrary to what is frequently stated, a lowered oxygen pressure is less favorable to growth than the pressure of oxygen in air. The rôle of carbon dioxide in promoting growth is discussed, and it is concluded that this substance acts, not by altering the acidity of the medium, but by virtue of its power of diffusing rapidly through the intact cell wall and giving rise to an increase in the intracellular H-ion concentration."

**The type of foot-and-mouth disease virus occurring in the Netherlands in 1928–1930** [trans. title], A. J. Winkel (*Tijdschr. Diergeneesk., 58 (1931), No. 15, pp. 793–801; Ger., Eng., Fr. abs., p. 801*).—In studies made in the Netherlands in 1928 and 1929 the strains differentiated belonged to the A type of foot-and-mouth disease virus, but since the spring of 1930 only the O type has been observed. It was found that an injection of one type only may confer a heterologous immunity.

**Rats as carriers of Mexican typhus fever**, H. Mooser, M. Ruiz Castaneda, and H. Zinsser (*Jour. Amer. Med. Assoc., 97 (1931), No. 4, pp. 231, 232, figs. 2*).—The authors report having found the causative agent of Mexican typhus fever in the brains of *Mus rattus*, trapped in locations where typhus fever is prevalent. They regard this rat as a carrier of the disease and an important factor in epidemiological control.

**Avian tuberculosis in normal and vaccinated rabbits**, E. M. Medlar (*Amer. Jour. Path., 7 (1931), No. 5, pp. 475–490, pls. 5, fig. 1*).—The author finds that there is a significant difference in the gross pathology, histopathology, and leucocytic reaction of nonvaccinated and vaccinated rabbits intravenously inoculated with virulent avian tubercle bacilli. "The leucocytic response in the vaccinated rabbits simulates very closely the leucocytic reaction we have observed in human beings who have progressive tuberculosis. This reaction is not specific for tuberculosis, but is caused by unmixed tubercle bacillus infection. The megakaryocyte plays an important rôle in acute avian tuberculosis in the rabbit. What the real significance of the participation of the megakaryocyte in acute tuberculosis is can not be stated at present."

**Methods of segregation for control and eradication of bovine contagious abortion**, W. B. C. Danks (*Kenya Colony Dept. Agr. Bul. 11 (1931), pp. 6*).—Three methods of segregation for control and eradication of bovine abortion are described.

**Bovine mastitis: A short review of present knowledge**, F. C. Minett (*Jour. Dairy Research [London], 2 (1930), No. 1, pp. 84–90*).—This review of the status of knowledge of bovine mastitis, which is presented in connection with a list of 51 references to the literature, deals with the distribution and economic importance, forms, method of spread, diagnosis, and control.

**The use of pyrethrin in the treatment of verminous bronchitis of bovines** [trans. title], Ricaud and Camus (*Rev. Path. Compar., 31 (1931), No. 418, pp. 720–724*).—The authors report having found intratracheal injections of pyrethrin in oil to be inoffensive and to give nearly complete control of verminous bronchitis of bovines when administered in doses of from 5 to 10 cc. When complicated with bronchial pneumonia, it may be necessary to repeat the injection.

**A note on the experimental transmission of "louping-ill" to mice**, J. M. Alston and H. J. Gibson (*Brit. Jour. Expt. Path., 12 (1931), No. 2, pp. 82–88*).—The authors' studies have shown that a hitherto somewhat obscure disease of sheep can be transmitted to the mouse, and open the way to a more extended study of the disease and its causative virus.

**Mortalities in sheep associated with grazing on young pasture plants, with special reference to Chenopodium atriplicinum**, H. R. Seddon and H. G. Belschner (*Aust. Vet. Jour., 7 (1931), No. 2, pp. 68–70*).—The authors present experimental proof that *C. atriplicinum*, a common plant of the western herbage country of Australia, when consumed in large quantities over several days in its young stage is the cause of losses in sheep.

**The treatment of equine surra with Naganol and Höchst 4002** [trans. title], O. Nieschulz (*Tijdschr. Diergeneesk., 58 (1931), No. 15, pp. 812–814;*

*Ger., Fr., Eng. abs., p. 814*).—Previous experiments having shown that equine surra can not be cured with the benzenearsonic compound Höchst 4002,[2] experiments were conducted in which it was combined with Naganol. Four weeks after having been experimentally infected with surra, when the horse showed heavy clinical symptoms, it received 20 mg. of Naganol per kilogram body weight intravenously and 30 mg. of Höchst 4002 intramuscularly. The treatment was well tolerated; the horse recovered and was still in good health a year later. A dog infected with surra was also successfully treated in this way.

**Parasites of horses,** A. E. Cameron (*Canada Dept. Agr. Bul. 152, n. ser. (1931), pp. 22, figs. 24*).—A practical summary of information on the more important parasites of the horse.

**Bacillary white diarrhea as a factor in the poultry industry,** C. P. Fitch (*U. S. Egg and Poultry Mag., 37 (1931), No. 11, pp. 50, 51, 64–66*).—This account calls attention to the importance of pullorum disease and the application of control measures.

**Colds and roup in poultry,** A. Broerman and B. H. Edgington (*Ohio Sta. Spec. Circ. 35 (1931), pp. 4, fig. 1*).—A brief practical account.

**Cutaneous vaccination against fowl pox with a pigeon-passed (fowl pox) virus (H D virus) in the Dutch East Indies** [trans. title], W. K. Picard (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Veeartsenijk. Meded., No. 77 (1931). pp. 42, figs. 3; Ger., Eng. abs., pp. 40–42*).—Immunization against fowl pox in the Dutch East Indies, which formerly consisted in the subcutaneous injection of a formalin-treated fowl virus, has since 1929 been carried out by the cutaneous application of a live vaccine. It having been found that a pox virus from the turkey, pigeon, and duck did not give satisfactory results, an efficient vaccine was at last obtained by passing the fowl pox virus through the pigeon. This vaccine is applied with a scarotrephine on the defeathered thigh. Five or six days after the application a local reaction develops in the form of a circumscribed swelling of the feather follicles which disappears on the twelfth day. The general condition of the bird and egg laying are not disturbed, the reaction remaining localized without a tendency to become generalized.

This so-called H D virus is produced by repeated transmission on the defeathered breast skin of the pigeon. By 54 passages within a period of two years the originally highly virulent virus has been attenuated and gives a fixed immunity. In the preparation of the vaccine the virus-producing pigeons are killed on the twelfth day, the breast skin is removed and passed through the organ mill of Latéfy, the ground material being dried for 24 hours in a Faust-Heim apparatus at 37° C., and finally stored in a desiccator over calcium chlorate. The vaccine for practical application contains 1 gm. of virus material on 50 cc. of a 60 per cent solution of glycerin-sodium chloride. Since the potency of the dry virus is of short duration (2 weeks), thus far the vaccine has had to be prepared from freshly made material.

**A survey of infectious laryngotracheitis of fowls,** W. R. Hinshaw (*California Sta. Bul. 520 (1931), pp. 36, figs. 6*).—This is a summary of information collected during 1930 in a field survey covering the most important poultry sections of California and by correspondence with poultry specialists and veterinarians in the United States and Canada. Following a brief summary and introduction, the subject is dealt with under the headings of history and distribution of the disease in the United States and Canada; history and distribution in California; mode of dissemination; factors influencing the yearly recurrence of and predisposition to the disease; seasonal distribution; mortality, course, morbidity, and immunity; effect on egg production; susceptibility of fowls other than chickens; treatment and control; and prevention.

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[2] Arch. Schiffs u. Tropen Hyg., 34 (1930), No. 12, pp. 662–669.

The average mortality based on file records on 75 flocks was 11.15 per cent, with extremes of from 0 to 48.66 per cent. The average course of the disease in the investigated cases was 15 days, with extremes of from 4 to 39 days. In a group of 25 producing flocks, 85 per cent of all deaths occurred within 15 days and 98 per cent within 21 days. The greatest mortality occurred on the eleventh day, and 70 per cent of all losses were from the fifth to the fifteenth day. Fowls and wild birds other than chickens are not as a rule susceptible to natural outbreaks of the disease, for which no satisfactory treatment was found.

Careful nursing, attention to the comfort of the birds, avoidance of excessive excitement, and proper feeding were observed to be the best control measures. Prevention in an infected area is a community problem and consists of proper attention to disposal of dead birds, manure, and litter; the control of mechanical carriers; attention to the cleaning and disinfection of secondhand feed sacks and poultry crates; and the control of community and plant sanitation, as well as individual attention to the health of birds. Prevention in a disease-free area involves precaution in the introduction of stock, in addition to the above recommendations.

A list is given of 68 references to the literature.

**A study of mortality and egg production in flocks affected with infectious laryngotracheitis**, W. R. Hinshaw, E. E. Jones, and H. W. Graybill (*Poultry Sci., 10 (1931), No. 7, pp. 375–382, figs. 3*).—This is a report of cooperative work in which the California Experiment Station cooperated with the Los Angeles County Livestock Department and the State Department of Agriculture.

"Data are presented on mortality and egg production in 25 outbreaks of infectious laryngotracheitis affecting 14,574 chickens in producing flocks in 8 poultry districts of California. The average course of the disease in the investigated cases was 15 days, with extremes of 7 to 27 days, 85 per cent of all deaths occurring by the end of 15 days and 98 per cent by the end of the twenty-first day. The mortality was 1,916 birds, or 13.15 per cent, while the estimated loss in egg production was 1,883⅔ doz. eggs. The greatest mortality was on the eleventh day, and 70 per cent of all losses were from the fifth to the fifteenth days. The production started to drop 4 days after the onset and reached the predisease percentage production 30 days later, with a maximum drop of 12 per cent. The minimum egg production in the composite group was on the eighteenth day after the onset of the disease and 7 days after the maximum mortality. The monetary losses from mortality and drop in egg production were estimated at $2,500 and $678.12, respectively, or a total of approximately $3,200."

**Infectious laryngotracheitis of fowls**, A. Broerman and B. H. Edgington (*Ohio Sta. Spec. Circ. 36 (1931), pp. 3, fig. 1*).—A practical summary of information.

**A type of nutritional leg paralysis affecting chicks**, R. M. Bethke, P. R. Record, and D. C. Kennard (*Poultry Sci., 10 (1931), No. 7, pp. 355–368, fig. 1*).—This contribution from the Ohio Experiment Station describes a type of paralysis affecting the legs and feet of growing chicks similar to that reported by Norris and his associates (E. S. R., 63, p. 863).

In the experimental work dried skim milk, dried buttermilk, dried whey (Kraco), a milk concentrate (XX Liquor), good quality alfalfa leaf meal, and autoclaved yeast proved effective in preventing the paralysis and in increasing the rate of growth. Wheat middlings (20 per cent) carrying the major portion of the germ and wheat germ (10 per cent) gave increased growth but were ineffective in preventing the paralysis. The paralysis was found to be distinctly different from rickets, hock joint disease (slipped tendon), and the "crazy chick" disorder.

**[Parasites of poultry in Guam]**, F. B. L. Guerrero (*Guam Sta. Rpt. 1930, p. 8*).—Carbon tetrachloride in coconut oil was found by the station to be the most efficient treatment for roundworms of poultry and also an effective treatment for tapeworms.

**Intestinal worms of chickens**, C. M. Ferguson (*Ohio Agr. Col. Ext. Bul. 89 (1930), pp. 14, figs. 9*).—A practical account.

**Poultry farm sanitation and disease control**, A. R. Winter (*Ohio Agr. Col. Ext. Bul. 115 (1931), pp. 72, figs. 64*).—This is a practical account of the diseases of poultry and means of prevention and control.

**Some diseases of rabbits** (*[Gt. Brit.] Min. Agr. and Fisheries Bul 14 (1931), pp. III+12*).—This is a practical summary of information.

**Paratyphoid in the rabbit** [trans. title], Lesbouyries (*Rec. Méd. Vét., 107 (1931), No. 5, pp. 257–264, figs. 2; abs. in Vet. Rec., 11 (1931), No. 39, p. 1000*).—An account is given of studies made of an epidemic of abortion in rabbits, in which an organism was isolated which possessed the morphology, cultural characteristics, and serologic reactions of the paratyphoid B group, type Breslau or Aertrycke.

**The occurrence of Gaertner infection on fox farms** [trans. title], G. Schoop (*Deut. Tierärztl. Wchnschr., 39 (1931), No. 29, pp. 449–451; abs. in Vet. Rec., 11 (1931), No. 39, p. 1001*).—A description is given of a disease of foxes from six weeks to a few months old which appears to be due to *Bacterium enteritidis*.

## AGRICULTURAL ENGINEERING

**Daily river stages at river gage stations on the principal rivers of the United States**, compiled by M. W. Hayes (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 28 (1930), pp. III+156*).—This volume contains the daily river stages for 1930 and is the twenty-eighth of a series for daily river stages on the principal rivers of the United States (E. S. R., 65, p. 74).

**Surface water supply of Snake River Basin, 1929** (*U. S. Geol. Survey. Water-Supply Paper 693 (1931), pp. VI+183, fig. 1*).—This report, prepared in cooperation with the States of Idaho, Oregon, Nevada, and Washington, presents the results of measurements of flow made on streams in the Snake River Basin during the year ended September 30, 1929.

**Some studies of the need for irrigation**, O. E. Robey (*Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 71–76, figs. 3*).—The results of a study of the rainfall of the Michigan area are reported and discussed with reference to the need for supplemental irrigation, especially for such crops as potatoes.

The data available indicate that at least 12 in. of water are needed for potatoes during the months of June, July, and August in the area. It appears that supplemental irrigation may be advantageous where the rainfall data show too long intervals between rains.

**A note on soils regarding their suitability for making irrigation engineering works exposed to water**, J. Charlton (*Agr. and Livestock in India, 1 (1931), No. 2, pp. 119–127*).—Studies are reported, the purpose of which was to develop a quick, simple, and reliable test of soils which will establish their suitability for making dams, liability to erosion, and the like. Special attention is devoted to the so-called kyatti, or sticky, soils.

The results, while very variable, indicate that the presence of carbonates lowers the tensile strength of clay-water pastes at the sticky point. It was also found that the majority of soils described as kyatti were strongly alkaline. Shaking these soils with either distilled or irrigation water in the ratio of 1 part of soil to 10 parts of water for a period of 1 hour caused these soils to be dispersed by the alkali which they contain and to give relatively stable suspensions. From the results it appears that a good soil will give a depth of settled material in the test tubes of less than 0.5 in. and no color or only very faint traces. Between 0.5- and 0.75-in. depth of sediment indicates soils which are potentially dangerous, and the intensity of the pink color developed is a deciding factor. If the depth of sediment exceeds 0.75 in., the soil is definitely a bad sample of kyatti and should be avoided if possible.

A general phenomenon noticed is that, even where good surface soil free from kyatti occurs in the dry zone, sampling to lower depths frequently indicates the presence of kyatti.

**Economical use of large tile for land drainage,** R. D. Marsden (*U. S. Dept. Agr., Tech. Bul. 269 (1931), pp. 24, figs. 6*).—The results of a critical survey of drainage records in 31 counties in Minnesota, Iowa, Wisconsin, Illinois, Indiana, Michigan, and Ohio are presented, the purpose being to study the economy of using large draintile.

It was found that tile of large diameter have been used for draining land in many instances where open ditches would have provided drainage for less cost. The annual expenditures for maintenance of tile drains by 106 drainage districts, representative of general conditions in the upper Mississippi Valley, averaged about two-thirds of 1 per cent of the cost of the tile and the labor of installation. The average annual cost of keeping open ditches in fairly effective condition in the same region is indicated to be about 5 per cent of the cost of excavation and damages. On the basis of average prices paid for drainage construction during 1922 to 1925 and annual maintenance expenditures capitalized at 6.75 per cent per year, it appears that tile drainage and open ditches may be equal in ultimate cost when the purchase of tile and trenching, laying, and back filling will be from 70 to 100 per cent greater than the cost of excavation and damages for the open ditch.

Graphs and formulas are presented for reducing the labor of making such comparisons.

**The problem of soil saving in the Hawaiian Islands,** T. C. Zschokke (*Hawaii Univ. Agr. Ext. Bul. 11 (1931), pp. 25, figs. 8*).—This bulletin deals with erosion losses in the Hawaiian Islands and considers methods for preventing erosion of agricultural land. The methods recommended for saving top soil include better tillage, the use of cover and green manure crops, the installation of broad base terraces, and the laying out of plant rows and ditches in a manner such as to handle surface run-off more effectively. Erosion of pasture lands has been prevented by planting grasses, forage plants, shrubs, and trees.

**Care and use of explosives,** E. Godfrey (*Engin. Jour., 14 (1931), No. 10, pp. 521–523*).—The author treats briefly the precautions necessary in the use of explosives for various industrial purposes and the requirements for their safe storage. Methods of drilling and spacing holes are discussed, together with the type of explosives required for different purposes, including stump, bowlder, and ditch blasting.

**Public Roads, [November, 1931]** (*U. S. Dept. Agr., Public Roads, 12 (1931), No. 9, pp. 217–236+[2], figs. 9*).—This number of this periodical contains the current status of Federal-aid road construction as of October 31, 1931, data on gasoline taxes, first half of 1931, and an article on Bituminous Treatments on Sand-Clay and Marl Bases in South Carolina, by H. C. Jones and E. L. Tarwater (pp. 217–235).

**Acid resisting metals: A few comparative tests,** J. W. McMyn and V. Edge (*Jour. Soc. Chem. Indus., Chem. and Indus., 50 (1931), No. 23, p. 474*).—In a contribution from the Royal Technical College of England, tabular data are presented indicating the effect of various solutions on three so-called acid-resisting metals when compared at different concentrations and temperatures and for different periods. The tests were conducted on small strips of the metals 3 by ½ by ⅛ in. each, immersed in approximately 60 cc. of the solution in a wide test tube. The cold tests were conducted at room temperature and the hot tests in a large water bath heated to 80° C.

One of the metals was a steel containing a considerable amount of chromium. The second consisted chiefly of nickel and copper, and the third of copper with some aluminum and nickel. The last alloy showed the least corrosion in the majority of cases. The chromium steel in cold 30 per cent sulfuric acid lost considerably in weight in the first 24 hours and still more in a week. Using fresh acid during the second week there was much less loss in weight, and no further attack occurred by a third supply of fresh acid during the next three weeks. Evidently after the first attack a passive surface is obtained which is quite resistant to further attack by cold 30 per cent sulfuric acid. It also was found to resist attack even up to a temperature of 60°.

**Stress distribution in reinforced concrete columns** (*Concrete and Construct. Engin., 26 (1931), No. 9, pp. 528–530, fig. 1*).—The results of tests of stress distribution in reinforced concrete columns, conducted by the National Physical Laboratory in England, are briefly summarized, a new method of determining stress distribution being deduced.

**Strength tests of creosoted Douglas fir beams,** J. F. Harkom and G. H. Rochester (*Canada Dept. Int., Forest Serv. Circ. 28 (1930), pp. 14, figs. 14*).—This is a report of the effect of creosoting by the boiling-under-vacuum process on the strength of Douglas fir beams 6 by 12 in. by 13 ft. in dimension.

The results show a reduction in strength due to incising and to treating separately and jointly. The total reduction for both incising and treating is 13 per cent, whereas for incising it is 7 and for treating alone 18 per cent. This is attributed to the fact that incising prior to treatment decreases to a certain extent the checking which occurs in creosoting without previously incising by relieving seasoning stresses.

**New paints from synthetic resins,** D. H. Killeffer (*Sci. Amer., 145 (1931), No. 4, pp. 238, 239, figs. 3*).—The results of a few experiments with paints made from synthetic resins are briefly reported. It is stated that ways have been found of so modifying synthetic resin that it is soluble in such materials as China wood oil. The combination yields a varnish similar in all respects to ordinary varnishes but possessing greater durability, hardness, elasticity, resistance to washing, and the like. It also can be made to dry hard for a second coat in a time comparable with that required by lacquers. The fact that the new synthetic phenolic resins will not allow ultra-violet light to pass greatly prolongs the life of varnishes made with them when exposed to sunlight. They are also highly resistant to the action of any destructive agencies dissolved in water.

**Factors controlling engine-carbon formation,** W. H. Bahlke, D. P. Barnard, J. O. Eisinger, and O. FitzSimons (*S. A. E. [Soc. Automotive Engin.] Jour., 29 (1931), No. 3, pp. 215–222, figs. 14*).—The results of studies are reported which show that the combustion-chamber carbon-forming properties of an oil are indicated with a satisfactory degree of reliability by its total volatility. A carbonizing index for engine oils can be obtained by determining the temperature at which 90 per cent has been evaporated in a simple distillation at an absolute pressure corresponding to 1 mm. of mercury. The Conradson carbon residue value seems not to be a generally reliable carbonization criterion.

**Prevention of valve-seat erosion,** E. M. Getzoff (*S. A. E. [Soc. Automotive Engin.] Jour., 29 (1931), No. 4, pp. 332–335, figs. 7*).—A theory for the cause of the thin spotty deposit on the valve seats of internal-combustion engines which accelerates erosion is advanced, and the results of investigations summarized which indicate that this deposit is absent on valve seats made of nonferrous metal. Aluminum bronze gives satisfactory results, but is difficult to secure to cast-iron cylinder blocks because of its greater coefficient of expansion. Several other more successful methods of securing aluminum bronze rings to cast iron are briefly described.

**Stresses in wheels,** E. G. Coker (*Nature [London], 128 (1931), No. 3222, pp. 174, 175, figs. 2*).—A brief summary of investigations of wheel stresses is presented, and curves showing the distribution of stresses are superimposed on wheel diagrams. These show that the combined effect of both axle and tire is to increase the radial stress on the axle greatly.

**The combined harvester-thresher in Ohio,** E. A. Silver and J. H. Sitterley (*Ohio Sta. Bul. 491 (1931), pp. 50, figs. 17*).—This bulletin consists of two parts.

Part 1, by Sitterley, deals with economic considerations and gives information on the adaptability of the combined harvester-thresher to Ohio conditions. The advantages are enumerated as (1) lowers harvesting costs, (2) reduces harvest labor, (3) reduces length of harvest season, (4) creates independence of exchange labor, (5) improves the picking up of down grain, (6) spreads the straw, and (7) reduces the cost and number of harvest meals. The disadvantages are the large investment, the loss of straw, and the difficulty in handling green material.

Part 2, by Silver, relates entirely to engineering matters and gives both technical and practical information on combine construction, power requirements, care and operation of combines and combining under different conditions, the prevention of grain losses by different methods, grain drying, soybean harvesting, and the handling of straw.

**Feed grinder investigations,** E. A. Silver (*Ohio Sta. Bul. 490 (1931), pp. 49, figs. 36*).—This bulletin presents practical and technical information on the operation and care of feed grinders and reports data from tests of feed mill efficiency, the effect of size of screens on fineness of grinding, and on the uniformity of size of ground particles.

The data on the effect of moisture content of grain on power requirements show that nearly twice as much feed containing 10 per cent moisture can be ground per horsepower hour as feed containing 25 per cent moisture. It appears that moisture in the grain has a greater effect in increasing the power requirements for grinding than moisture in the cob.

The burr mill was found to be very satisfactory for grinding shelled corn or other grains having a high dry starch content to a medium or coarse size. The hammer mill gave superior results for fine grinding of these feeds and for oats grinding. It also is found that slower speeds of hammer mills produce a coarser product and higher speeds a finer product. However, if the speed is reduced much below its rated revolutions per minute the fan may be unable to elevate the material, especially when grinding oats.

**Good practice in construction,** P. G. Knobloch (*New York: Pencil Points Press, 1931, pts. 1–2, combined and rev., pp. [10], pls. 114*).—Parts 1 and 2 of this publication have been combined and revised, and consist of a series of plates showing modern practice in building construction.

**Construction of farm buildings,** T. GESTESCHI (*Konstruktion Landwirtschaftlicher Bauwerke. Berlin: Julius Springer, 1930, pp. VIII+284, figs. 426*).—This is a technical treatise on the design and construction of farm buildings written from the German viewpoint. It pays attention especially to the structural engineering features of the work and devotes considerable attention to stress distribution in roof members and the like. It contains chapters on dwellings, roofs, stalls, grain storages, silos, implement sheds, vegetable storages, and bridges and water towers.

**Bibliography relating to farm structures,** G. ERVIN (*U. S. Dept. Agr., Misc. Pub. 125 (1931), pp. 43*).—A bibliography relating to farm structures is presented which contains material in the English language classified according to subjects. No references are included relating to equipment such as heating, lighting, ventilation, and refrigeration.

**A colony brooder house for the farm flock,** J. R. REDDITT and P. R. HOFF (*Nebr. Agr. Col. Ext. Circ. 730 (1931), pp. 13+[1], figs. 8*).—Practical information is given on the planning and construction of a colony brooder house for Nebraska conditions.

**The trench silo in Nebraska,** I. D. WOOD and E. B. LEWIS (*Nebr. Agr. Col. Ext. Circ. 713 (1931), pp. 16, figs. 13*).—Practical information on the construction of trench silos is presented.

**A practical underground storage,** D. COMIN (*Ohio Sta. Bimo. Bul. 153 (1931), pp. 215–223, figs. 4*).—General information is given on the construction of underground storages for fruit and vegetables, together with working drawings and information relating to the construction of the experimental storage used at the station. This storage is 12 by 54 ft. in plan and is built of reinforced concrete. Forced ventilation with an electric fan is used to supplement the natural ventilation.

**Biological engineering,** A. J. M. SMITH (*[Gr. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1930, pp. 80–102, figs. 4*).—A description is given of a refrigerating chamber in the Ditton Laboratory which is designed primarily for the study of problems of refrigeration control in the cold storage of fruit. A second refrigerating chamber is also described which can be used either as a ventilated storage without refrigeration or as a refrigerated storage without insulation.

In addition, experiments are reported on the refrigeration of different foods for the purpose of showing the importance of the different factors to be considered in research along this line. It is pointed out that water is the predominant constituent of foodstuffs commonly placed in cold storage. Special attention is given to data secured with eggs and apples, and to preliminary data secured with cheese. It was found with eggs that the rate of air movement at constant humidity has no effect upon the rate of evaporation, and that the rate of evaporation is limited by factors internal to the egg. It appears that the shell is the most obvious source of resistance to the passage of water vapor.

**Heating stock water during zero weather,** J. B. MCLAIN (*Elect. West, 67 (1931), No. 3, p. 135, figs. 2*).—A brief description is given of equipment for the heating of stock water by electricity in areas of Idaho.

**Elements of water bacteriology with special reference to sanitary water analysis,** S. C. PRESCOTT and C. E. A. WINSLOW (*New York: John Wiley & Sons; London: Chapman & Hall, 1931, 5. ed., rev., pp. IX+219, figs. 2*).—This is the fifth revised edition of this book (E. S. R., 51, p. 889).

**Sewage disposal for rural dwellings** (*Ohio Agr. Col. Ext. Bul. 112* (*1930*), *pp. 24, figs. 20*).—Practical information is given on the design of sewers and sewage treatment plants for rural residences having less than 10 inhabitants. The general features involved in sewage disposal are discussed, and the most satisfactory methods adaptable under the conditions concerned are presented.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**A graphic summary of American agriculture based largely on the census,** compiled by O. E. BAKER (*U. S. Dept. Agr., Misc. Pub. 105* (*1931*), *pp.* [*2*]+*228, figs. 360*).—This is a revision and enlargement of the publications previously noted (E. S. R., 35, p. 191; 48, p. 289). It portrays the returns from the 1925 agricultural census, supplemented by a number of maps based on the estimates of the Department of Agriculture, and covers physical conditions, land utilization and crops, farm animals and tractors, farm expenditures, cooperative marketing and purchasing, number and size of farms, value of farm property, farm mortgage debt, farm taxation, farm tenure, farm labor, farm population, and roads.

[**Investigations in agricultural economics at the Michigan Station**] (*Michigan Sta. Quart. Bul., 14* (*1931*), *No. 2, pp. 94–100*).—In an article entitled What the Farm Contributes to Farm Family Living, a table with explanatory text by E. B. Hill and H. A. Berg shows the amounts and values of farm products used by the farm households on 51 Michigan farms in 1929.

In an article entitled Shifts in Farm Land Utilization in Michigan, by Hill and P. F. Aylesworth, tables with explanatory text show the number of farms, percentage of land in farms, and acreages of different classes of farm land in Michigan, 1910, 1920, 1925, and 1930, and the percentage changes from 1925 to 1930 in the different classes of land and acreage in specific crops in the State and in selected counties in the different type-of-farming areas.

[**Investigations in agricultural economics at the Ohio Station**] (*Ohio Sta. Bimo. Bul. 153* (*1931*), *pp. 244–246, fig. 1*).—A map based on a survey made by C. G. McBride and T. K. Cowden shows, by counties, the division of northern Ohio according to the major outlet for dairy products in the markets of the section.

A table by J. I. Falconer shows, by years 1913–1930 and by months from January, 1930, to August, 1931, the index numbers for wholesale prices of all commodities in the United States, weekly earnings of New York State factory workers, prices paid by farmers for commodities, farm product prices, Ohio farm wages, Ohio farm real estate, Ohio farm product prices, and Ohio cash income from sales.

**Production of crops and livestock on the Newlands project, 1930,** F. B. HEADLEY and C. VENSTROM (*Nevada Sta. Bul. 123* (*1931*), *pp. 14, figs. 2*).—This bulletin compiles and compares the 1930 census reports of the U. S. Reclamation Bureau with previous records. It supplements the bulletin previously noted (E. S. R., 64, p. 186).

**Cost of producing field crops in the Salt River Valley, Arizona, 1928,** S. P. CLARK (*Arizona Sta. Bul. 139* (*1931*), *pp. 653–667, figs. 12*).—This study is based on data obtained by the route method. Tables are given and discussed showing (1) the amount and cost of man labor and of horse work, the costs for tractor work, machinery, seed, water, hoeing and thinning, ditch expense, taxes, interest, picking, weighing and hauling, and ginning, and the yields, returns, and net profits per acre on each of 36 fields in short staple cotton and 32 fields in Pima cotton; (2) the average time spent on and cost of different operations in producing each type of cotton; (3) the amount and cost of man labor and horse work for different operations, the costs for machinery, water, taxes, interest, and other expenses, and the yields, and returns per acre on each of 22 fields of alfalfa; and (4) the yields, costs per acre and per 100 lbs. of grain, returns per acre, and amounts of man labor, horse work, and tractor work per acre on each of 44 fields of wheat.

**Alfalfa, E. W. Braun** (*California Sta. Bul. 521 (1931), pp. 37, figs. 11*).—Alfalfa production in the 11 Western States and in the rest of the States of the United States; the alfalfa-weevil quarantine; the acreage, production, and utilization of alfalfa in California; the relation of distribution of alfalfa production and that of dairy cows in California; the shipments of alfalfa from different sections of the State; the receipts at Los Angeles and San Francisco; the shipments of alfalfa and alfalfa meal by water to the Atlantic coast; the trend of prices and price spreads between different areas of the State; the seasonal movement of alfalfa prices in California; the factors affecting the price of alfalfa hay; and the price outlook in the State are discussed. Some of the facts found were as follows:

The average total annual tonnage of alfalfa in the State increased from 3,400,000 tons for the years 1919–1921 to 4,256,000 tons for the years 1928–1930, 30 per cent of the increase being due to increased acreage and 70 per cent to increased yields per acre. The county distribution of the production shifted materially. The distribution of dairy cows, except in Los Angeles and Humboldt Counties and the San Francisco Bay counties, closely approximated the distribution of alfalfa production. Conditions current in 1930 and 1931 suggest a price level for alfalfa materially lower than that prevailing during the period 1921–1929. The spread in the price of alfalfa between Los Angeles and both San Francisco and the Imperial Valley has been appreciably narrowed in recent years. Alfalfa hay prices were found to tend to follow a distinct seasonal movement, rising materially from August to January and falling materially from February to July.

The yearly average price of alfalfa hay in the State was found to be determined primarily by the size of crop, the number of dairy cows, and the price of feed concentrates commonly used in dairy rations. A change of 0.25 ton per cow in the size of crop has resulted in a change of $1 per ton in the Los Angeles price of hay. An increase of $1 per ton in the weighted average price of feed concentrates tended to change the price of hay 55 cts. per ton.

It is thought that the general level of the price of alfalfa will probably continue relatively low for the next year or two, as the feed requirements for dairy cows are likely to remain low and the tonnage of alfalfa is apt to be maintained or increased as long as prices of agricultural products of the State remain low. From a long-time point of view, if there are no further major declines in the general level of prices a material improvement in the price of alfalfa hay in the State may be expected.

**Systems of farming in Oklahoma.—No. 1, Wheat farming in north central Oklahoma, P. H. Stephens and E. Rauchenstein** (*Oklahoma Sta. Bul. 199 (1931), pp. 56, figs. 8*).—This study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, is the first of a series dealing with business organization and operation of farms in different type-of-farming areas of the State. It is based on survey records of farm business in 1928 obtained by personal interviews for slightly over 100 farms each in areas in Garfield and Blaine Counties. The areas and the trends in the organization of farms are described. The present organizations and the incomes, expenses, net farm income, labor income, rate earned on investment, distribution of income, and the farm products used in the home, etc., are discussed. The effects of size of business, rates of production of crops and livestock, efficiency of operation, prices, and other factors on success in operation are analyzed. The possibilities of using the results of the study are illustrated by comparison of the returns from a 160-acre and from a 442-acre farm under present organization with the estimated returns under suggested reorganization.

**Operations of the Poultry Producers of Southern California, Inc.,** J. M. TINLEY and E. A. STOKDYK (*California Sta. Bul. 516 (1931), pp. 106, figs. 13*).—The purpose of this study was to analyze the conditions under which eggs are marketed in Los Angeles and the operations of the Poultry Producers of Southern California, Inc., with a view to ascertaining whether there have been such material changes in the demand and supply situation or in the market structure for eggs in Los Angeles since the formation of the association in 1917 as would render successful operation of the association difficult, and whether under present conditions a cooperative association for handling eggs has any place in the market structure and, if so, what policies should be followed by such an association. The study is based on information obtained from the files and records of the Poultry Producers of Southern California, the Poultrymen's Cooperative Milling Association, the Giannini Foundation, the Produce Exchange of Los Angeles, and other bodies, and from interviews with producers, dealers, and others.

The Los Angeles market for eggs; trade channels and practices; prices of eggs in Los Angeles and other markets; the organization, operation, by-laws, and sales methods and policies of the Poultry Producers of Southern California; and the Poultrymen's Cooperative Milling Association are described and discussed.

The findings regarding the present association are summarized, and the recommendations made to the boards of the Poultry Producers of Southern California and the Poultrymen's Cooperative Milling Association regarding a plan for reorganization are given.

**Seasonal feed costs of dairy production,** E. E. JACOBS (*[Oklahoma] Panhandle Sta., Panhandle Bul. 32 (1931), pp. 7*).—Tables are given showing for the Holstein dairy herd at the station farm from January, 1930, to September, 1931, the monthly amounts and costs of different feeds fed, the average price, production, and value of butterfat, the margin between value of butterfat and cost of feed, and the cost of production per pound of butterfat.

**The marketing and distribution of fruits and vegetables by motor truck,** B. EDWARDS and J. W. PARK (*U. S. Dept. Agr., Tech. Bul. 272 (1931), pp. 88, figs. 13*).—This bulletin presents a general picture of the motor truck transportation of fruits and vegetables in the United States. It deals chiefly with transportation over distances of 20 or more miles, and is based mainly upon interviews with 2,203 farmers, shippers, and truckmen in producing sections and 250 wholesale dealers, on records and observations of representatives of the Federal market-news service, and on records of the Delaware State Highway Department.

The quantity shipped by motor truck compared with that shipped by railroad and boat; receipts on city markets; trade and operating practices of truckmen, farmers, truckmen carriers, and truckmen merchants; the effects of shipping by truck in marketing fruits and vegetables upon distribution, production, and transportation; regional motor truck markets and wholesale roadside markets: the adaptability of certain products to motor truck transportation and such transportation as compared with other forms of transportation; motor truck transportation in Delaware and the Eastern Shore of Maryland and Virginia.

in the Cumberland-Shenandoah sections of Maryland, Pennsylvania, and West Virginia, in New Jersey, in the Hudson Valley, on Long Island, in western New York, and in Connecticut and Massachusetts, southeastern Pennsylvania, southern Indiana, southern Illinois, southwestern Michigan, North Carolina, and Texas; motor truck unloads in Boston, Cincinnati, Denver, New York City, Los Angeles, Salt Lake City, St. Louis, Indianapolis, and Buffalo, Rochester, and Syracuse, N. Y., and other cities; the redistribution by motor truck from Baltimore, Pittsburgh, and other cities, and the effect of such redistribution on the trade; and the relation of motor truck transportation to cold storage and processing plants are analyzed and discussed.

**Crops and Markets [October–November, 1931]** (*U. S. Dept. Agr., Crops and Markets, 8 (1931), Nos. 10, pp. 409–456, figs. 3; 11, pp. 457–496, figs. 3*).—Included are tables, charts, notes, reports, and summaries of the usual types. No. 10 also includes the 1931 feed outlook.

**Minnesota agricultural indexes of prices, quantities, and cash incomes, 1910–1927,** A. G. Black and D. D. Kittredge (*Minnesota Sta. Tech. Bul. 72 (1930), pp. 90, figs. 7*).—Monthly and yearly indexes of (1) prices and (2) quantities sold of Minnesota farm products, and (3) gross cash incomes of Minnesota farmers, 1910–1927, are computed, using the following products: Wheat, corn, oats, barley, rye, flax, hay, potatoes, hogs, cattle, calves, lambs-sheep, chickens, eggs, butterfat, and milk.

The formula used for prices was

$$\sqrt{\frac{\Sigma[p_1 \quad q_{0\,(cm)}]}{\Sigma[p_{0\,(cm)} \quad q_{0\,(cm)}]} \times \frac{\Sigma[p_1 \quad q_1]}{\Sigma[p_{0\,(cm)} \quad q_1]}}$$

in which $p_1$ is the price in current month, $q_1$ quantity marketed in current month, $p_{0\,(cm)}$ average price in corresponding months of 1924, 1925, and 1926, and $q_{0\,(cm)}$ average quantity marketed in corresponding months of 1924, 1925, and 1926.

The formula used for quantities was

$$\sqrt{\frac{\Sigma[q_1 \quad p_{0\,(cm)}]}{\Sigma[q_{0\,(cm)} \quad p_{0\,(cm)}]} \times \frac{\Sigma[q_1 \quad p_1]}{\Sigma[q_{0\,(cm)} \quad p_1]}}$$

in which $q_1$ is the quantity marketed in current month, $p_1$ price in current month, $q_{0\,(cm)}$ average quantity marketed in corresponding months of 1924, 1925, and 1926, and $p_{0\,(cm)}$ average price in corresponding months of 1924, 1925, and 1926.

That for gross cash income was

Price index × quantity index.

The need for a Minnesota farm-price index, the choice of the years 1924, 1925, and 1926 as the base period, the system of weighting used, and the principal objection to the use of the Minnesota formula are discussed.

A table is also included showing the price indexes, monthly and yearly 1910–1927, of the three major groups of products—livestock, dairy and poultry, and crops.

Charts are presented showing the price indexes of cotton and cottonseed and of all groups of agricultural commodities in the United States and of Minnesota farm products, 1922–1927; the Minnesota price indexes of all 16 products and of the major groups, 1910–1927; the Minnesota quantity indexes, 1910–1927; the Minnesota gross cash income indexes, 1910–1927; the gross cash income of Minnesota farmers, by years 1910–1927; and the percentages of the income each year arising from each of the 16 principal products.

Pages 30–90 give the sources of the price and quantity data and the methods used in estimating the amounts of the different products sold.

**Resources and public finances of Michigan in relation to the forest tax problem,** P. A. Herbert (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 13 (1931), pp. [8]+40+[63], figs. 7*).—Additional data to those previously noted (E. S. R., 63, p. 586; 64, pp. 187, 573) relative to forest taxation in the Lake States are presented. The data are analyzed by county groups—forest Lower Peninsula, forest Upper Peninsula, mineral, farm, farm-urban, and urban. Comparable data are also given for five selected counties in the forest regions.

The area and population of the State and of the county groups; the present utilization of land; the trends in the use of land for agriculture, for timber production, and for recreation; income and wealth; ownership of forest land; public roads; public schools; assessment procedure; taxable area; assessed valuation; the tax levies; limitations of a fiscal analysis by property tax levies; the trends in State and county levies; tax delinquency; the public debt; public revenue from other than the general property tax; and road and school finances are described and discussed.

**Movement of open country population in Ohio,** P. G. Beck and C. E. Lively (*Ohio Sta. Bul. 489 (1931), pp. 46*).—This bulletin continues the study previously noted (E. S. R., 64, p. 576), and deals with the territorial movements and occupational changes of 1,589 of the children who had "started for themselves." The age and sex, schooling, marital status, occupation, and location—type of community and distance from home—of the migrants are described and discussed. Analysis is made of (1) the age and sex distribution, schooling, marital status, occupation, and location—open country, village, or city, and distance from parental home of the migrants; (2) the relation of occupation, size of farm business, movement and occupational history, schooling, and organization affiliation of, and farm inheritance by, parents, and of the number of brothers and sisters, order of birth, age, age at time of starting for self, initial occupation, parental home of spouse, and schooling of migrants to occupational mobility; and (3) the relation of occupation, section of the State, initial location, date of migration, and schooling of migrants to the type of community to which migrants went and of the type of community and occupation to distance migrants moved from the parental home.

At the time of starting for themselves, 7 per cent of the male migrants became farm owners, 16 per cent tenants, 18 per cent farm laborers, 45 per cent nonagricultural laborers, and 14 per cent entered the so-called "white collar" occupations. Of those who began as farmers, 80 per cent were still farming at the time of this survey. Of those starting in the nonagricultural occupations, only 6 per cent returned to the farm. Of every 100 owners, 54 began as owners, 21 as tenants, 16 as farm laborers, 6 as nonagricultural laborers, and 3 in the "white collar" occupations.

Occupation, tenure, organization affiliations, and occupational and movement history of parents; size of parental farm business; age, age at the time of starting for self, and schooling of migrants; and the economic condition of agriculture at the time migrants started for themselves were found to be closely related to the proportion of the male migrants entering farming. Age, time of starting for self, schooling, organization affiliation of parents, and number of younger brothers and sisters were the most significant factors in the case of females.

Approximately 60 per cent of the male migrants entering farming were the sons of the 50 per cent of the farmers with the largest farm business. These parents in turn had moved least, changed occupation least, participated to a greater degree in community organization activities, and had made more than average success.

The eighth grade was the maximum schooling obtained by 83 per cent of the male migrants in agriculture, as compared with 56 per cent of those in nonagricultural occupation. About one-fifth of the high school graduates became farmers. Most of those entering, but not completing, the high school became nonagricultural laborers.

Considering the various factors, the authors state that "it would appear that agriculture is drawing a majority of its future farmers from those individuals who are most likely to be successful in the occupation."

**Rural organization, 1929** (*Amer. Country Life Conf. Proc., 12 (1929), pp. IX+186*).—This includes the proceedings of the twelfth American Country Life Conference, held at Ames, Iowa, October 17–20, 1929 (E. S. R., 61, p. 579). Included are the following papers: Rural Organization, 1929 (Presidential Address), by F. O. Lowden (pp. 1–13); Contributions of this Conference to Rural Organization (Conference Summary), by A. R. Mann (pp. 14–23); The Government's Farm Program, by A. M. Hyde (pp. 24–31); International Aspects of Rural Organization, by K. L. Butterfield (pp. 32–35); The Wallace Memorial (Opening Statement), by H. C. Taylor (pp. 36, 37); Rural Social Justice, by C. C. Taylor (pp. 38–42); The Need of a Rural Life Program, by H. C. Taylor (pp. 43–49); The Master Homemaker, by Mrs. C. W. Sewell (pp. 50–52); Rural Student Interests, by E. L. Kirkpatrick (pp. 53–55); Types of Rural Organizations, by M. McDonald (pp. 56–59); Local Rural Organizations, by E. L. Kirkpatrick (pp. 59–62); Community Score Cards as Instruments for Correlating Community Programs of Work, by N. T. Frame (pp. 62–66); Distinctive Features of Community Organization in Missouri, by F. Boyd (pp. 67–71); County Agricultural Councils, by J. R. Hutcheson (pp. 71–75); State Goals for Farm Bureaus, by Mrs. E. Richardson (pp. 75–77); A Rural Development Commission, by H. C. Taylor (pp. 77–84); Rural Adult Education and Culture, by J. Willard (pp. 85–87); The Need for Adult Education in Rural Organization as Seen by a Farm Woman, by Mrs. W. Van Bloom (pp. 87, 88); Radio Programs as They Affect Rural Adult Education, by W. I. Griffith (pp. 89–92); Methods of Developing a Local Organized Program of Adult Education, by M. E. Olson (pp. 92–94); Types of Adult Education in the Farm and Home Bureaus, by K. Van A. Burns (pp. 94–96); Types of Health Programs, by H. Albert (pp. 97–99); Distinctive Features of Rural Health and Welfare Work, by J. H. Bridgens (pp. 99–101); The Farm Bureau and the Social Agencies, by Mrs. O. E. Milner (pp. 101–103); Nutrition Projects and Health Programs, by M. E. Brown (pp. 103–105). Country Doctors and the Cost of Medical Care, by E. E. Munger (pp. 105–107); Training for Rural Social and Health Work, by W. Burr (pp. 107–109); Development of County-Wide Projects, by R. B. Sayre (pp. 110, 111); Yearbooks as Factors in the Success of Local Organizations, by G. W. Westcott (pp. 112, 113); Services of Home Demonstration Agents, by J. Newton (pp. 113–115); Jobs Which Confront a State Farm Organization, by G. E. Metzger (pp. 116–118); Aims and Activities of the Iowa Farm Bureau Federation, by D. V. Williams (pp. 118–120); How Efficient Is the Local Government in My Community? by Mrs. W. D. Miller (pp. 121, 122); Changes in State Legislation Affecting Local Government, by F. W. Nelson (pp. 122–124); What Services Do Federal Departments Furnish to Farm People? by D. V. Williams (pp. 124–126); What Are the Equalization Problems in State

Legislation and What Can Be Done in Regard to Them? by C. L. Stewart (p. 127); Timely Programs Developed by Community Organziations, by Mrs. C. Arthur (pp. 128, 129); A Program of Landscaping and Recreation, by J. R. Fitzsimmons (pp. 130–132). Program and Goals of the Dallas County Farm Bureau Landscape Project, by Mrs. D. C. Bice (pp. 132, 133); Spiritual Resources of Rural Life, by E. V. O'Hara (pp. 134–137); Conserving Rural Values in Religious Service, by A. H. Rapking (pp. 137–139); Facts from an Iowa Church Survey, by W. N. Wentworth (pp. 139–141); Larger Parish Plans, by E. Larsen (pp. 141–143); The Class "A" Rural Program for Churches, by A. H. Bartter (pp. 143–145); Duties of Members, Officers, and Directors in Cooperative Associations, by K. Espe (pp. 146–148); The Parish Credit Union, by J. M. Campbell (pp. 148–150); What Should We Expect from Co-operatives? by R. M. Hall (pp. 151–153); Education in Country Life, by C. B. Smith (pp. 154–158); The School's Relation to the Agricultural Problem, by H. L. Ells (pp. 158–161); Development of Vocational Education, by C. A. Fulmer (pp. 161–164); Introducing a New Course of Study for Elementary Schools, by J. Parker (pp. 164, 165); The Parent-Teacher Association, by Mrs. B. C. Hopkins (pp. 165-167); Tasks for Local Parent-Teacher Associations, by A. Johnson (pp. 167–169); Program of a County Schoolmasters' Club, by A. E. Jewett (pp. 169, 170); Directing Vocational Training, by W. H. Lancelot (pp. 171, 172); Possibilities in Urban-Rural Relations as Seen by a Farm Woman, by Mrs. C. Decatur (pp. 173–175); Local Problems in Urban-Rural Relations, by L. J. Murphy (pp. 175–179); and The Des Moines Trade Area, by J. D. Adams (pp. 179–181).

**Standards of living** (*Amer. Country Life Conf. Proc., 13 (1930), pp. XI+165*).—The proceedings of the thirteenth American Country Life Conference held at Madison, Wis., October 7–10, 1930, includes among other data the following papers: Rural Standards of Living (Presidential Address), by F. O. Lowden (pp. 1–11); An Interpretation of the Conference, by C. C. Taylor (pp. 12–21); Continental Conservation, by R. L. Wilbur (pp. 22–29); Cultural Standards and Cooperative Marketing, by J. C. Stone (pp. 30–35); An American Standard of Living for the American Farm Family. by A. M. Hyde (pp. 36, 37); Building a Rural Civilization, by G. Russell ("AE") (pp. 38–41); The Rural Child in a Social Program, by G. Abbott (pp. 42–51); A. C. L. A. Student Conference, by E. L. Kirkpatrick (pp. 52–54); Ability to Pay and Standards of Living—A Summary Statement, by P. E. McNall (p. 55); Standards of Living as a Basis for Organizing Agricultural Extension Programs, by E. Merritt (pp. 56, 57); How the Plan Works in South Dakota, by A. E. Anderson (pp. 57–60); Facts About Farm Incomes, by M. L. Mosher (pp. 60–64); What Is to Be Done about Improving Farm Family Living, by J. D. Black (pp. 64, 65); How Organized Labor Uses Standards of Living as a Practical Objective, by J. R. Commons (pp. 65–68); The Standard of Living and Ability to Pay—Some Conclusions, by B. H. Hibbard (pp. 68–70): Rural Electrification as Affecting Standards of Living—Situation and Need, by T. A. Coleman (pp. 71–73); All-Weather Roads Are Essential Factor in Country Living, by K. L. Hatch (pp. 73–75); Rural Problems in Highway Administration, by F. J. Sequin (pp. 76, 77); An Array of Home Resources, by F. W. Beckman (pp. 78–82); Long Time Program Planning, by R. Schleppi (pp. 82, 83); Making the Most of Home Resources through Child Training and Guidance, by H. Harbage (pp. 84–88); Better Use of Home Grown Foods, by M. Brady (pp. 88, 89); Making the Most of Home Resources through Budgets and Accounts, by Mrs. A. R. Rohlfing (pp. 89–92); Time for Work and Leisure, by D. R. Mitchell (pp. 92–94); Value of Physical Activities, by R. B. Tom (pp. 95–97); The Wisconsin Experience in Rural Dramatics, by Mrs. C. Felton (pp. 97–99); Rural Iowa Becomes Musical, by A. Secor (pp. 99–101); The Need for the Artistic Emphasis in the Rural Home and Its Surroundings, by J. Ford (pp. 102–104); The Approved Farm Home Project as Fostered in Michigan, by I. Leonard (pp. 104–106); Distinctive Features of Wisconsin Home Beautification Contest, by F. A. Aust (pp. 106, 107); Beauty in American Life, by L. Taft (pp. 107–109); Preserving Natural Landscape in a County Park System, by I. S. Horgen (pp. 109–111); Some First Steps in Highway Beautification, by N. A. Morris (pp. 111–113); Factors in the Community Which Affect the Home and Standard of Living, by E. C. Morgan (pp. 114–119); Community Development and Co-operation through Standard Community Associations, by B. L. Hummel (pp. 119, 120); Community Scoring in West Virginia, by C. E. Stockdale (pp. 120, 121); Plans for Community Development and the Cooperation of Agencies through a Citizen's Community Survey, by Mrs. G. Kerkhoff (pp. 122, 123); Improvements in the Standard of Living by a Complete Organization of the Town and Country Community, by C. J. Galpin (pp. 123–125); New Developments in Community Service for Education, by J. Callahan (pp. 125–127); New Developments in Community Service for Religion, by M. A. Dawber (pp. 127–129); New Health Policies for Community Service, by G. W. Henika (pp. 129–131); The Unit Requirement Idea for Local Government in Rural Areas, by T. B. Manny (pp. 131–134); Rural America—And Social Work, by A. Williams (pp. 135–139); The County and Social Work, by E. Foster (pp. 139, 140); The Church and Social Work, by H. Holt (pp. 141, 142); Distinctive Features of Rural Culture, by L. H. Bailey (p. 143); Character Building Elements in the Contribution Which Rural Life Is Making to the Nation Today, by K. L. Butterfield (pp. 143, 144): The Contribution of Rural Life to the Nation through Population Shifts, by C. J. Galpin (pp. 144–146); Social and Political Contributions Which Rural Life Is Making to the Nation Today, by E. A. Ross (pp. 146–148); and Basic Elements of Rural Culture Objectives to Be Projected into the Next Generation, by Mrs. H. Johnson (pp. 148–150).

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**Constitutional basis of public school education**, E. S. LIDE (*U. S. Dept. Int., Off. Ed. Leaflet 40 (1931), pp. [1]+11*).—The provisions of the constitutions of the several States pertaining to schools in general and to the organization, support, and control of schools are briefly summarized.

**A manual in Canadian agriculture**, J. C. READEY (*Toronto: Ryerson Press, 1930, pp. XVI+300, figs. 137*).—This handbook for public school teachers sets forth an explanation of some of the principles underlying the problem of Canadian farm life. The several chapters deal with soil, fertilizers, different crops, different kinds of livestock, dairying, poultry, fruits, farm pests, and gardens. A bibliography of publications of the Dominion and the several Provinces is included.

**Poultry enterprises**, S. DICKINSON and H. R. LEWIS (*Chicago and London: J. B. Lippincott Co., 1931, pp. [VII]+424, figs. 252*).—This textbook for vocational agricultural students analyzes the poultry business into 20 jobs. Suggestions of activities which will aid in understanding the chief operations of each job and for local inquiries, neighborhood studies, etc., are made.

**Swine enterprises**, A. L. ANDERSON (*Chicago and London: J. B. Lippincott Co., 1931, pp. IX+458, figs. 195*).—This textbook for vocational students and others analyzes the swine enterprise into 27 jobs. Statistical methods of proving teachings, recent experiment station findings on swine practices, feeding standards, standardized swine practices, production tests, suggestions for local inquiries and activities and for debates and discussions, and lists of available reference materials are included.

## FOODS—HUMAN NUTRITION

**Some ways of cooking and using whole and cracked wheat** (*Illinois Sta. Circ. 382* (*1931*), *pp. 12*).—This circular, prepared by G. B. Armstrong, S. Woodruff, H. T. Barto, and J. Outhouse, discusses the nutritive value of whole wheat and the extent to which it can safely be used in the diet, and gives general directions for preparing and cooking whole wheat and cracked wheat, tested recipes for their use, and breakfast, dinner, and supper menus suggesting ways in which other foods may be combined with wheat or wheat dishes prepared from these recipes.

**Studies in the nutritive value of Indian vegetable food-stuffs.—Part I, Nutritive values of pigeon pea (Cajanus indicus) and field pea (Pisum arvense, Linn)**, S. P. Niyogi, N. Narayana, and B. G. Desai (*Indian Jour. Med. Research, 18* (*1931*), *No. 4*, *pp. 1217–1229*, *pl. 1*).—This study forms a part of an investigation of the nutritive value, particularly with respect to protein, of some of the more important Indian vegetable foodstuffs. Both of the pulses studied are grown extensively in India. The pigeon pea (*C. indicus*), sold in the form of split peas, enters largely into the vegetarian diet of the people. The field pea (*P. arvense*) is eaten either in the form of dry seeds or in the young green state.

Since the major part, nearly 80 per cent, of the proteins of leguminous seeds belongs to the class of globulins, the total globulins of both pulses were isolated and analyzed for amino acids, and the biological values of the pure globulins as well as of the total proteins in the whole seed were determined at approximately a 5 per cent level of intake by the Mitchell method (E. S. R., 51, p. 407).

The two pulses, obtained in the local market, were sun dried, decorticated, and ground to a flour to pass a 60-mesh sieve. Specimens of the flour dried at 100° C. had the following composition for the pigeon pea and field pea, respectively: Ash 3.99 and 2.75, crude fiber 1.16 and 1.08, ether extractives 2.44 and 1.45, crude protein (N × 6.25) 25.63 and 25.57, carbohydrates by difference 67.38 and 69.15, and true protein determined separately 22.14 and 23.31.

The globulins were extracted with 10 per cent NaCl solution, precipitated by dialysis or by dilution and acidification, purified by washing several times with distilled water, and finally dehydrated with alcohol and ether. The nitrogen content on an ash and moisture-free basis of the pigeon pea globulin was 15.82 per cent by dialysis and 15.72 per cent by dilution. Corresponding values for the field pea were 16.45 and 16.44 per cent, respectively.

The nitrogen distribution expressed as percentage of protein on an ash and moisture-free basis was as follows for the pigeon pea and field pea, respectively: Lysine (Van Slyke) 7.03 and 8.19, histidine (Van Slyke) 2.56 and 1.9, arginine (Van Slyke) 5.84 and 9.5, arginine (direct estimation) 6.91 and 10.64, cystine (Folin and Looney) 1.58 and 1.12, tyrosine (Zuwerkalao) 3.12 and 1.98, tyrosine (Folin and Ciocalteu) 3.35 and 2.32, and tryptophane (Tillmans and Alt) 0.46 and 0.51 per cent.

From the metabolism data, the average biological values at a 5 per cent level of intake for the pigeon pea and field pea, respectively, were 69 and 48 (as compared with 89 for casein). At the same level the whole seeds had biological values of 79 and 69.

**Penetrometer measurements of "doneness" in cooked vegetables**, M. D. Sweetman and M. C. Lancaster (*Jour. Home Econ., 23* (*1931*), *No. 6*, *pp. 565–567*).—A standardized procedure for determining doneness in cooked vegetables, with the use of an adaptation of a commercial penetrometer, is described for potatoes, with data illustrating its reliability. Similar studies have been carried on with carrots, with results that "suggest its applicability in a wide variety of studies on the texture of cooked vegetables. Limitations can be expected in instances where the nature of the material and the texture at doneness result in such rapid penetration, even by larger needles, that the time can not be measured accurately with a stop watch."

**The relation of storage temperature of potatoes to their culinary quality,** M. D. SWEETMAN (*Amer. Potato Jour., 8 (1931), No. 7, pp. 174–176*).—Attention is called to various observations, including the author's own studies at the Maine Experiment Station (E. S. R., 64, p. 193), which indicate that temperatures below 40 to 45° F., often recommended for the storage of potatoes, cause undesirable accumulation of sugar.

**Soft-curd milk: Nature's food for infants,** R. L. HILL (*Arch. Ped., 48 (1931), No. 7, pp. 417–425, fig. 1*).—This discussion of the author's extensive studies on soft-curd milk (E. S. R., 65, p. 689) deals particularly with variations in the curd of milk of different breeds and of milk from individual cows at different periods of lactation.

**A critical clinical study of concentrated and dried infant foods,** A. G. DE SANCTIS and J. D. CRAIG (*Arch. Ped., 48 (1931), No. 7, pp. 439–456*).—This paper includes a review of the literature on the use of sweetened condensed milk in infant feeding, a discussion of its composition, and a report of a clinical study of 50 infants fed sweetened condensed milk in comparison with a control group of the same number receiving a cow's milk dilution and with data reported in the literature on the use of other foods.

It is concluded that sweetened condensed milk apparently meets the nutritional requirements of the normal infant, but that the dilutions ordinarily used are too strong for the average infant.

**Cost of living studies.—III, The food of twelve families of the professional class,** M. G. LUCK and S. WOODRUFF (*Calif. Univ. Pubs. Econ., 5 (1931), No. 4, pp. VI+247–293*).—In the foreword by J. B. Peixotto the scope of this investigation is stated to be "an intensive examination of the way in which persons with incomes sufficient to permit a reasonable range of choice have made selection among the foodstuffs in the market and have prepared them for family use." An introductory chapter explaining the methods followed and one dealing with the cost and choice of foods are contributed by M. G. Luck and a chapter on the nutritive value of the diets by S. Woodruff.

The study, which began February 1 and ended August 31, 1927, covered 12 families in which the housewives kept records for 3 months or longer of foods purchased for the family use during the month. No attempt was made to evaluate losses due to waste or spoilage or to estimate the amount of food used from stock on hand at the beginning of the study. The cost of food included only materials bought for cooking at home. The number of meals away from home was recorded, but no attempt was made to determine their content or cost. Of the 12 families, 9 were connected with the university. In 7 of the families there were no children at home, and in the entire number there were only 6 children. The findings, therefore, apply chiefly to adults.

The calculations of cost of food purchased were made on a per capita basis regardless of age or sex. The average expenditure per capita was between 65 and 70 cts. a day, or about $20 a month, with the entire range from 50 to 96 cts. a day. The families at the two extremes were childless couples, one a young couple trying to live very economically and the other beyond middle age and comparatively well-to-do. In comparison with previous studies, as reported in the literature, the average expenditure was high. Hitherto unpublished estimates by A. F. Morgan and M. E. Jaffa of standard food allowances for 1 month for a family of 5 in the professional class, with prices estimated from San Francisco prices for November, 1926, gave a per capita per diem cost of 46 and 60 cts., respectively.

The average distribution of expenditure among the various food groups was as follows: Meat, fish, and poultry 20.9 per cent, eggs 4.7, milk, cream, and cheese 17, cereal products 2.5, bread 3.8, pastry 3.5, sugars and sirups 3.7, butter 6.9, other fats 2.1, vegetables 14.1, fruits 13.8, coffee and tea 2.8, and sundries 4.2 per cent. Combining these foods, as suggested by Sherman, into five groups, with a rough division of 20 per cent of the total expenditure to each, these values are considerably above the suggested standard for the groups including meat, fish, poultry, and eggs, vegetables and fruits, and pastry, sugar. butter and other fats, and sundries, but lower for milk, cream, and cheese and decidedly lower for the cereal products. It is considered that these families, all of whom had some knowledge of dietetics, approached more closely the standards of an adequate diet than any other American group thus far studied.

Information is given on the food selection within the various groups and on the types of menus. Attention is called particularly to the simplicity of the meals. "Not only did these families belong to the 'well-educated' class of Americans; their financial circumstances were good enough to warrant spending freely to satisfy their tastes in food. These tastes were simple and conformed closely to the recommendations of dietitians. By and large they present a highly desirable type of diet, and the group is perhaps unique among American studies in that no single family of its membership was seriously undernourished."

In the analysis of the nutritive value of the foods purchased, Hawley's double scale (E. S. R., 58, p. 84) for estimating the energy, protein, and mineral needs of adults and children was employed. In comparison with the adult male unit of 3,000 calories, 67 gm. of protein, 0.68 of calcium, 1.3 of phosphorus, and 0.015 gm. of iron per day and with no allowance for waste. the average values for each item exceeded the standard. With an allowance of 10 per cent for waste, the averages fell slightly below the standard for calories and iron, but still above for the other items. Of the individual diets. 5 ranged from 2.600 to 2,800 calories a day and 4 from 3,200 to 3,700. None fell below the standard of 67 gm. of protein and 4 were above 100 gm. One diet fell below the standard for calcium, 2 for phosphorus, and 1 for iron. All of the 12 families used vitamin-rich foods in abundance.

As in the case of food costs, the nutritive value of the diets was compared with those of other studies. It is noted in conclusion that although these diets appear in a favorable light as to nutritive value with others of a less expensive nature, they were not in all cases so superior in nutritive value that this alone would justify the greater expenditure of money upon them. "The desire for variety of flavor and form in food was in part responsible for the cost."

**Foods used by rural families in Ohio during a three-year period, H. McKay and M. A. Brown** (*Ohio Sta. Bul. 492 (1931), pp. 37, figs. 2*).—In this complete report of an investigation noted previously from preliminary reports (E. S. R., 64, p. 692), particular attention has been paid to the year by year fluctuations in the money value of the foods used and the distribution of calories among the food groups in the records available for the three years of the study, and to the cost and nutritive values of the diets of 18 families keeping records for the three consecutive years.

The average diet for the first year, 1926, was found to be adequate in every factor, but the averages for 1927 and 1928 were below the standard for energy value and iron content. The percentages of food produced on the farm for use in the home in the three successive years were 74.5, 72.3, and 72.2 per cent of the total, respectively. The money values of the diets per adult male unit averaged $134, $121, and $120, respectively. The money values of the food produced on the farm for use in the home were 59, 56, and 55 per cent, respectively, of the total money value of the food used. The year in which the diets ranked highest was the one in which the farm contributed most to the food supply.

The trends in expenditures for the principal food groups were noted in the previous progress report.

The calorie distribution among the various food groups differed materially from the divisions recommended by Rose (E. S. R., 59, p. 188). The percentages of calories derived from meat and other protein-rich foods and from sugars and other sweets were much higher, and the percentage of calories derived from milk and cream was considerably lower than the recommended values. It is considered that "a rearrangement of the diets with a higher percentage of the calories derived from milk, fruits, and vegetables, and possibly from cereals, and with a lower percentage of calories from meat and other high-protein foods and from sugar would undoubtedly improve the quality of the diets at the points where improvement is most needed, namely, in regard to mineral and vitamin provision."

The general findings in the analyses of the diets of the 18 families keeping records for the three years have also been noted. Only 2 of the entire number of families had average diets which were adequate during each of the three years, but for 11 families the average diet for the three-year period was adequate in every factor considered. The average amounts of the foods used by each of these 11 families and the costs of the diets for the three-year period have been assembled in tabular form to serve as quantity food budgets.

In comparison with the inadequate diets, those which were adequate had a lower percentage of calories derived from meat, a higher percentage from fruits and vegetables, and approximately the same for milk and cream, cereal products, and sugar and sweets. The average cost of the adequate diets was 41 cts. per adult male unit per day as compared with 31 cts. for the inadequate.

Among the adequate diets there was a fairly wide variation in degree of adequacy, total cost, and distribution of cost. Five families averaged in excess of 20 per cent and 1 in excess of 10 per cent more calories than the standard, and the average money value of these high calorie diets was 43 cts. per adult male unit per day as compared with 38 cts. for those families having a lower but still adequate calorie diet. All of the diets contained more than the standard proportion of protein. The average cost of 8 diets in which the protein exceeded the standard by from 40 to 60 per cent was 42 cts. per adult male unit per day, while the diets containing the smaller, but still above average, amounts of protein averaged only 38 cts. per adult male unit per day. Similar higher costs were noted for the diets exceeding the standard values in other essential constituents. These findings are thought to show that slight changes in the spending plan would make possible adequate diets at no greater cost than those of the inadequate diets of the study.

**Changes in stature, weight, and body build of female students at the University of Minnesota during a period of eighteen years, C. M. Jackson** (*Anat. Rec., 49 (1931), No. 1, pp. 71–80, fig. 1*).—Data on the age, weight, and height of all women students entering the University of Minnesota from 1912 to 1929, inclusive, have been subjected to statistical analysis. The measurements included 16,786 individuals, the number increasing each year with two or three exceptions from 400 in 1912 to 1,393 in 1929. During this period of 18 years, there was a decrease of about one-fourth year in the mean age of the students at entrance, a slight but significant increase (about 0.1 in.) in the mean stature, and an increase of 2.35 lbs. in body weight. The changes in body build, as measured by height-weight indexes, were much less marked, although showing a slight tendency to increase.

The data are shown to be in general agreement with corresponding data for women students entering other colleges during the same period. "On the whole, the evidence does not support the theory of an artificial decrease in body weight of college women to conform with female fashions in recent years."

**Basal metabolic rate of medical students and nurses in training at Charleston, S. C.**, R. E. Remington and F. B. Culp (*Arch. Int. Med., 47 (1931), No. 3, pp. 366–375*).—Data are reported on the basal metabolism of 93 student nurses from 18 to 34 years of age and 40 male medical students from 20 to 31 years of age at Charleston, S. C. The average of the lowest values obtained for each of the women subjects in calories per square meter per hour was 10.4, and for the male subjects 10.1 per cent below the Aub-Du Bois standards. To determine whether these low values and similar ones reported by Tilt for young women students in Florida (E. S. R., 63, p. 593) might be due to malnutrition, the weights of the subjects in both investigations were compared with the standard tables of the Life Extension Institute.

"Of the 52 subjects studied by Tilt, 32 were underweight and 20 overweight for their height and age, the average deviation being —2.3 per cent. Of 90 women included in our study, 52 were underweight and 38 overweight. the average deviation being —0.8 per cent. Of the medical students, 33 were below normal weight and 7 above, with an average deviation of —7.2 per cent. It is certain that any degree of malnutrition that would seriously affect the metabolic rate would be reflected in changes in weight markedly greater than these."

**The effect of lactose and the acid-base value of the diet on the hydrogen ion concentration of the intestinal contents of the rat and their possible influence on calcium absorption**, C. S. Robinson and C. W. Duncan (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 435–447, fig. 1; abs. in Michigan Sta. Quart. Bul., 14 (1931), No. 2, pp. 106, 107*).—This contribution from the Michigan Experiment Station reports studies of the effect of low and high levels of lactose feeding to rats on the reaction of the intestinal contents from the lower duodenum through the colon. Two types of diet were used. One was a regular stock diet consisting of ground grains and alfalfa, with cod-liver oil, and the other ground dog biscuit and cooked meat dried and ground. Two lots of the latter diet were prepared, one having an excess of acid and one of base. Groups of about 25 mixed white and piebald rats each received, respectively, the three basal rations alone and with 25 per cent of lactose, and the first two with 5 per cent of lactose. After the diets had been fed for at least 2 weeks, the animals were killed at least 1½ hours after feeding and their gastrointestinal tracts removed and tied off in seven sections—stomach, duodenum, three equal lengths of small intestines, cecum, and colon. The contents of each were expressed into small tubes with a minimum of water and centrifuged and readings made with a Cullen quinhydrone electrode. The collection of samples from the stomach and duodenum proved so difficult that the results from these sections were discarded.

The data, which were subjected to statistical analysis, showed that on the vegetable diet the pH of the intestinal contents increased to a maximum of about 8 in the lower ileum and dropped to approximate neutrality at the ileocecal valve. On the meat diet the reaction reached a maximum in the same region but at a lower level. The ingestion of lactose to the extent of 5 per cent of the ration reduced slightly the pH of the contents of the lower ileum and of the large intestines of the rats on the vegetable diet, but did not affect the level appreciably on the meat diet.

On the vegetable diet containing 25 per cent lactose, there was a marked lowering of the pH of the whole digestive tract below the duodenum. With the other sections the effect was much less and significant only in the ileum and cecum. On the high protein basic diet there was a significant increase in the alkalinity of the contents of the small intestines only when 25 per cent of lactose was included in the diet.

These results are thought to indicate that the nature of the diet is a determining factor in increasing the fecal acidity in lactose feeding, and to suggest that increased utilization of calcium affected by lactose, as observed with calves (E. S. R., 62, p. 790) and by Bergeim with rats (E. S. R., 56, p. 192), was apparent because of the use of vegetable diets.

**Diet in intestinal disorders,** J. A. Bargen and Sister M. Victor (*Jour. Amer. Med. Assoc., 97* (*1931*), *No. 3, pp. 151–153*).—This contribution from the division of medicine of the Mayo Clinic and the department of nutrition of St. Mary's Hospital, Rochester, Minn., consists of general suggestions relating to diet for chronic intestinal ailments, with a quantitative dietary regime for patients with chronic ulcerative colitis, a nonresidue diet for use before operation, and a diet for use after colostomy. Particular attention is paid in the dietary treatment of ulcerative colitis to the addition of foods rich in minerals and vitamins as rapidly as possible to the restricted bland diet necessary at the beginning of the treatment.

**Iron deficiency in the white rat and the white mouse,** S. Bliss and M. L. Thomason (*Soc. Expt. Biol. and Med. Proc., 28* (*1931*), *No. 6, pp. 636–638*).—In this preliminary report, feeding experiments on rats and mice are summarized which, in the opinion of the authors, tend to confirm the theory that pellagra is an iron-deficiency disease (E. S. R., 64, p. 595).

Two types of diets low in iron were used. One was a synthetic diet of casein, sucrose, butterfat, lard, and a salt mixture low in iron, but assumed to be otherwise balanced, a vitamin B concentrate (Harris), and viosterol, and the other a diet of natural foodstuffs including banana, orange juice, sucrose, freshly separated egg white, and cream, with the same salt mixture, viosterol, vitamin B concentrate, and agar. On these diets the rats grew well, but lost their hair in bilaterally symmetrical areas. In the denuded areas a scaly dermatitis developed. The condition was not cured by ferric citrate added to the water or food, but was cured rapidly by cooked or dried liver, dried whole dog blood, or crystalline hemin fed in amounts calculated to furnish equivalent amounts of iron as determined from the state of negative balance. In mice crystalline hemin was used successfully as a prophylactic agent.

"Since our rats receive an abundance of the complete vitamin B group of substances, yet show much of the symptomatology of so-called G-avitaminosis or 'rat pellagra,' the question arises as to whether or not some of the confusion in the vitamin G issue may not be due to the inclusion of multiple variations of which the one here described may be more or less important."

**The effect of age, pregnancy, and lactation on the hemoglobin of the albino rat,** H. S. Mitchell and L. Miller (*Amer. Jour. Physiol., 98* (*1931*), *No. 2, pp. 311–317, figs. 2*).—Data are presented on the hemoglobin content of the authors' stock colony of rats during growth, after maturity, and in the females during pregnancy and lactation. The stock ration consisted of dried whole milk 20 per cent, rolled oats 10, peanut meal 12, yellow corn (ground) 10, dried celery tops 3, dried whole wheat bread 42, wheat germ 2, yeast 0.5, and salt 0.5 per cent. Fresh greens were fed about five times a week. The hemoglobin determinations were made by the Newcomer method, using a Bausch and Lomb hemoglobinometer with a blue filter in the eye piece. The observations were made on 62 rats, 34 females and 28 males. In 11, the observations were begun at 23 days of age and in the remainder from 83 to 518 days of age. The young males were observed for 36 weeks and the young females throughout their life span, including several periods of pregnancy and lactation.

The average value for the rats on the stock ration at 23 days of age was 8.9 gm. per 100 cc., at 30 days 12 gm., and at 50 days 15.6 gm. The values for the adult rats fluctuated between 15.3 and 16.6 gm., with an average of 16.2 gm. In all but 12 of the 145 cases of pregnancy observed, a developing anemia was evident within the first 5 days of gestation and increased as the period of gestation advanced. In every case there was a marked drop in hemoglobin at parturition and during the 3 following days. This was followed during the next 14 days by an equally marked increase. In the 7 days preceding weaning at 21 days of age, the gain in hemoglobin was retarded, but was resumed during the 9 days following the lactation period. The addition to the ration during the reproductive cycle of a mineral supplement of iron, copper, and manganese salts or of a yeast extract to furnish more of the vitamin B complex was without effect.

"The character of the hemoglobin changes associated with pregnancy seems to indicate that this apparent anemia is a physiological condition and not a pathological phenomenon. Clinical reports of anemia associated with human pregnancy offer an interesting analogy to these observations in the rat."

**Fat soluble vitamins.—XXXII, The distribution of vitamin A in tomato and the stability of added vitamin D, H. Steenbock and I. M. Schrader** (*Jour. Nutrition, 4* (*1931*), *No. 2, pp. 267–279, fig. 1*).—In continuation of the series of papers noted previously (E. S. R., 64, p. 793), a historical review is given of the literature dealing with the distribution of vitamins in tomatoes, and a study already noted from a preliminary report (E. S. R., 65, p. 492) is reported of the vitamin A content of a high grade commercial juice (Kemp) and of the clear filtered serum from this juice.

Using recovery from ophthalmia as the criterion (as noted more fully in the succeeding paper), ⅛ cc. of the whole tomato preparation sufficed to promote recovery from ophthalmia at a very slow rate, but not to maintain normal health. On ¼ cc. of the preparation daily ophthalmia was cured by the tenth week, and on ½ cc. by the eighth week or even earlier. It required 4 cc. of the clear tomato serum to approximate the response obtained with ⅛ cc. of the whole tomato preparation. The growth records correlated very well with the ophthalmia records in showing that the whole tomato juice has approximately 32 times as much vitamin A as the clear serum.

In attempts to demonstrate the presence of vitamin D in tomatoes, increasing amounts of the tomato were evaporated on the basal rickets-producing ration 2965, and the various rations were fed for 5 weeks to comparable groups of rats, after which the animals were killed and their fat-free femurs analyzed for ash. With the larger amounts of tomato, bone calcification and growth were both improved. Inasmuch as the tomato solids fed amounted in some cases to 25 per cent of the ration, with corresponding reduction in the calcium carbonate intake, the conclusion is drawn that the calcifying power of the tomato is actually very low. As noted in the preliminary report, the addition of irradiated ergosterol to the tomato juice is a practical way of fortifying it in vitamin D, since no loss in vitamin D potency was observed after storage of the fortified juice for 13 months.

**Fat soluble vitamins.—XXXIII, The determination of vitamin A and its stability in butter fat to ultra violet radiations, H. Steenbock and A. M.**

WIBICK (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 229–249, figs. 5*).—Samples of June butterfat irradiated for 30, 60, and 120 minutes, as described in an earlier paper of the series (E. S. R., 64, p. 793), were tested for vitamin A, with results indicating that irradiation sufficient to produce maximum antirachitic activity is accompanied by considerable destruction of vitamin A even when carried out in an atmosphere of carbon dioxide, nitrogen, or hydrogen. There was but little loss in the vitamin A remaining in the irradiated butterfat even after storage for seven months at room temperature. Since maximum antirachitic irradiation may not be necessary or desirable from the dietetic standpoint, it is thought that the antirachitic activation of butterfat by direct irradiation is a practical possibility without danger of destroying vitamin A.

The paper discusses at considerable length the authors' technic for vitamin A determination. The general procedure of Steenbock and Coward (E. S. R., 57, p. 392) was followed. In using ophthalmia as the criterion of vitamin A depletion and the cure of ophthalmia as the end point in the quantitative determination of vitamin A, four progressive and regressive stages were designated by number. Records of growth were also kept and compared with the cure of ophthalmia. The authors are of the opinion that "the growth observations harmonize with the cure of ophthalmia only when the loss in weight or the maintenance of constant weight previous to the change of the diet has been of short duration."

An attempt to use the vaginal smear method of Evans and Bishop (E. S. R., 50, p. 163) did not yield satisfactory results.

**A note on the vitamin content of the body oil of the herrings,** S. and S. SCHMIDT-NIELSEN (*K. Norske Vidensk. Selsk Forhandl., 3 (1930), No. 19, pp. 74–77*).—New determinations of the vitamin A and D content of the body oil of herrings (E. S. R., 64, p. 292) are reported. As a source of vitamin A alone, a daily dose of less than 30 mg. of the oil proved sufficient for normal growth in rats for a period of five or six weeks, after which the weight remained stationary. The possibility is suggested of "some uncontrolled factor in the herring oil of importance to the experiments on vitamin A."

Additional vitamin D tests on kippered herrings indicated that daily doses of from 5 to 12 mg. of the body fat were sufficient to cure rickets. It is again emphasized that "the content of vitamin D in fresh herrings, as well as in products such as kippered herrings and sardines, is sufficient to make them suitable substitutes for the cod-liver oil in the diet.

**Avitaminosis.—III, Specific effect of vitamin B on growth and lipid metabolism: Lipemia as a symptom complex in this avitaminosis,** B. SURE and M. E. SMITH (*Jour. Amer. Med. Assoc., 97 (1931), No. 5, pp. 301, 302*).—This continuation of the series of papers noted previously (E. S. R., 65, p. 494) constitutes a preliminary report of observations on rats suffering from a deficiency in vitamin B ($B_1$), indicating "the presence of a marked lipemia, i. e., a large increase in the concentration of lecithins, fatty acids, and the iodine number of the fatty acids, indicating unsaturation, in lactating mothers and nursing young and also in weaned animals, in this avitaminosis. Since there has been no definite yardstick by which to measure vitamin B deficiency from the standpoint of chemical analysis of the blood, as, for instance, the low phosphorus concentration in the case of rickets, it has been difficult to diagnose positively borderline cases of vitamin B deficiency as it exists in the United States, and it is hoped that a chemical study of the lipids of the blood will prove helpful to the clinician as a guide in vitamin B therapy, particularly in infant nutrition, in which anorexia is a common symptom complex."

**A deficiency of vitamin D in whale liver fat** [trans. title], S. and S. SCHMIDT-NIELSEN (*K. Norske Vidensk. Selsk. Forhandl., 3 (1930), No. 5, pp.*

*12–14*).—The authors report that a sample of whale liver fat obtained by ether extraction proved to be exceedingly rich in vitamin A but very deficient in vitamin D, thus resembling the liver fat of cartilaginous in contrast with bony fish (E. S. R., 64, p. 295). It is considered of significance that this mammal resembled the smallest cartilaginous fish in respect to its utilization of vitamin D.

**Studies on the influence of certain types of food upon the general condition of the animal organism** [trans. title], E. ABDERHALDEN (*Biochem. Ztschr., 234 (1931), No. 1–4, pp. 142–169, figs. 2*).—In this paper the author summarizes and discusses the vitamin studies which have been conducted in his laboratory during a period of 15 years. These include several studies which have been noted from other sources (E. S. R., 51, p. 563).

**Antirachitic potency of the milk of cows fed irradiated yeast or ergosterol: A clinical test,** A. F. HESS, J. M. LEWIS, F. L. MACLEOD, and B. H. THOMAS (*Jour. Amer. Med. Assoc., 97 (1931), No. 6, pp. 370–374, figs. 4*).—Clinical observations are reported on the use as a prophylactic against infantile rickets of milk from cows receiving irradiated yeast and viosterol in their feed, as noted on page. 463. Four of these biological activated milks were used from cows receiving daily the equivalent of 100,000 and 200,000 rat units of viosterol and 30,000 and 60,000 rat units of irradiated dried brewers' yeast, respectively. During the experimental period of three months, beginning early in January, 102 infants (23 negroes and 79 white) from 1.5 to 6 months of age were given the milk, with supplemental feeding of orange juice and for the older children cereals and vegetables, but no antirachitic agent.

Of the four test milks used, all except the weaker yeast milk were able to prevent rickets except in its minor manifestations, and in cases in which rickets was already present calcification occurred within a month.

This method of supplying vitamin D to babies is thought to be promising from a clinical point of view. "The outstanding advantage of this method of antirachitic therapy is that it functions automatically. The specific factor is incorporated in the diet of the infant, relieving the physician of dependence on the cooperaton of the mother."

**Ultraviolet light intensity of the sun in Porto Rico,** L. G. HERNÁNDEZ and E. B. MCKINLEY (*Porto Rico Jour. Pub. Health and Trop. Med., 6 (1931), No. 4, pp. 401–410*).—Using the oxalic acid uranyl-sulfate method of Anderson and Robinson, as developed by Tonney et al. (E. S. R., 61, p. 697), the authors have determined the intensity of solar ultra-violet radiation in San Juan, Porto Rico, hourly from 9 a. m. to 4 p. m. from Monday to Friday, inclusive, and until noon on Saturday for a six months' period, beginning October 16, 1930, and ending March 31, 1931.

The maximum readings were obtained as a rule between 10 a. m. and 2 p. m. and the minimum from 9 to 10 a. m. and from 3 to 4 p. m. The monthly averages were highest for January, February, and March, but the averages for November and December were only slightly lower. The values were in all cases much higher than those reported from the United States. readings from two to three times the minimum erythema reaction being common. These results are thought to be in keeping with the almost entire absence of rickets in Porto Rico.

**Studies on infantile beriberi based on five hundred fourteen cases,** J. ALBERT (*Philippine Jour. Sci., 45 (1931), No. 2, pp. 297–319, fig. 1*).—This paper consists largely of a historical résumé of the clinical and laboratory research leading to acceptance of the belief that infantile beriberi is a deficiency disease preventable and curable by antineuritic vitamin concentrates such as tikitiki. Tabulated data on the incidence of infantile beriberi in relation to total admissions at the Philippine General Hospital and of total births and deaths in relation to cases of and deaths from infantile beriberi from the Philippine Health Service by years for 1914 to 1930, inclusive, are reported to demonstrate the steady decrease in incidence of infantile beriberi subsequent to this discovery. The paper closes with a discussion of the etiology of the disease, with particular reference to the relationship between breast feeding in the Philippines and beriberi.

**Scurvy following an ulcer diet,** H. E. Martin (*Lancet [London], 1931, II, No. 6, pp. 293, 294*).—An instance of severe scurvy in a patient under dietetic and alkaline treatment for duodenal ulcer is reported. The diet, which had been followed vigorously for about six months, consisted chiefly of cereal products, eggs, and milk. An almost complete cure of the scurvy was effected within 10 days after changing to a diet including 4 lemons, 8 oz. of green vegetables, and 8 oz. of potatoes daily.

**Report of the Medical Research Council for the year 1929–1930,** Viscount D'Abernon et al. (*[Gt. Brit.] Med. Research Council Rpt. 1929–30, pp. 138*).—Of particular interest in this annual report (E. S. R., 63, p. 788) is the discussion in the general introductory report of the council (pp. 16–19) of important advances in the knowledge of vitamin A which have come about as the result of research conducted under its auspices. These include the work of Mellanby and associates on the relation of vitamin A to infection (E. S. R., 62, p. 294) and of Moore on the relation of carotene to vitamin A (E. S. R., 64, p. 393).

Of interest in the progress reports of research schemes on specific subjects are those on problems of child life (pp. 63–66), human nutrition (pp. 67–72), and dental disease (pp. 72–74).

**A simplified respiration apparatus for the simultaneous determination of oxygen and carbon dioxide** [trans. title], H. Schadow (*Klin. Wchnschr., 10 (1931), No. 17, pp. 783–785, figs. 2*).—A modification of the apparatus noted previously (E. S. R., 54, p. 204), is described and illustrated. The modification consists essentially in the introduction of a second smaller spirometer with only one-third the volume of the large spirometer, but operated in unison with it. The carbon dioxide absorption receptacle is connected with the smaller spirometer and is thus much smaller and of lighter weight than in the original apparatus.

## HOME MANAGEMENT AND EQUIPMENT

**Living expenditures of a selected group of Illinois farm and small-town families (1929–30),** R. C. Freeman and M. A. Souder (*Illinois Sta. Bul. 372 (1931), pp. 329–351, figs. 2*).—This study analyzes one year's records kept during 1929–30 by the home makers for 32 owners, 16 tenants renting from relatives, and 22 other tenant farm families, and 18 small-town families in 18 counties of Illinois. The characteristics of the farm families and their sources of income are discussed. Tables are included showing the distribution of expenditures of the farm and town families grouped according to ranges of realized income; the average clothing and personal expenditures for boys and girls under 6 years, from 6 to 14 years, and from 14 to 18 years of age; and the distribution of expenditures and the average yearly and daily food cost for the farm families grouped by sizes within the income ranges.

The average money value of the living of the farm families varied from $1,143 to $7,342, averaging $2,489, of which $832 worth was furnished by the farm. Of the total expenditures, 12 per cent was for savings and investments, 27 for food, 7 for operating expenses, 21 for shelter and furnishings, 8 for clothing, and 25 per cent for general expenditures. The expenditures of the town families averaged $3,662, of which 28 per cent was for savings and investments, 16 per cent for food, 10 for operating expenses, 13 for shelter and furnishings, 8 for clothing, and 25 per cent for general expenditures.

In the $1,000 to $1,999 income group of the farm families, there appeared to be but few choices as to how income could be spent, and size of family made but little difference in the distribution of expenditures. In the $2,000 to $2,999 income group, expenditures other than savings increased directly with the increase in size of family. Savings showed a decided decline. In the $3,000 and over group, the variation in the amounts devoted to different purposes was greater, indicating a greater freedom of choice. The most noticeable difference in the general expenditures of farm and town families was the larger expenditures of the town families for recreation. In the two lower income groups the automobile took the largest share of the amounts spent for general purposes. In the highest income group, education took the largest share.

For the farm families the daily food cost per adult unit varied from 36 to 57 cts. The average was 49 cts. for the lowest income group, 52 cts. for the middle group, and 40 cts. for the highest group. Food raised on the farm constituted 66, 63, and 54 per cent, respectively, of the value of food in the three groups.

**[Expenditures of farm families]** (*Montana Sta. Rpt. 1930, pp. 20–21*).—Monthly records for one year were obtained from 40 rural families in 7 counties of Montana. The gross cash income ranged from $808 to $7,560, averaging $3,503. The money spent for home living ranged from $419 to $3,976, averaging $1,089. An average of $341 per family was spent for food, and an average of $604 worth of food was supplied by the farm.

It is suggested that a more satisfactory distribution of expenditures would be possible by reducing those for food by more careful buying and by producing more food on the farm.

**The electric cooking load** (*Engineer* [*London*], *148* (*1929*), *No. 3848, p. 389, fig. 1; abs. in Sci. Abs., Sect. B—Elect. Engin., 33* (*1930*), *No. 386, p. 108, fig. 1*).—A special type of electric cooking stove is described and illustrated which overcomes the difficulty of short-period consumption of electricity. The maximum energy consumption is from 450 to 600 watts, and the operation depends on air circulation produced by a small fan. The heat reservoir is a cast-iron core in which the electric heating element is inserted. The core is surrounded by sand which is held in place by a perforated cover, the whole being inclosed in an air-tight sheet-iron casing. The principle of the apparatus is that if a wall at the temperature of the surrounding air is electrically heated on one side, a certain time will elapse before the temperature begins to rise appreciably on the other side. If the heating process continues, a definite and uniform temperature is established on both sides of the wall.

**A study of ice chests, F. R. Lanman** (*Ohio Sta. Bimo. Bul. 153* (*1931*), *pp. 209–215*).—A brief study is reported which was made to compare the temperatures maintained, the amount of ice melted, and the effect on the condition of certain foodstuffs in an ice chest having a ⅝-in. cork-board insulation with one having no special provision for insulation except that supplied by paper and a so-called dead air space, as in ordinary ice chests on the market.

The greater efficiency of the insulated chest as compared with the one having paper and air space was shown by the difference in (1) percentage of ice melted, (2) temperatures within the chests, (3) the ratio of increase in bacterial count of milk stored, and (4) the changes in condition of lettuce stored. In every respect the insulated chest was the better.

**Humidification for residences, A. P. Kratz** (*Ill. Univ., Engin. Expt. Sta. Bul. 230* (*1931*), *pp. 30, figs. 10*).—This bulletin brings together certain useful information on the subject from various sources and presents the results of laboratory experiments.

It has been found that optimum comfort is the most tangible criterion for determining the air conditions within a residence. An effective temperature of 65° F. represents the optimum comfort for the majority of people. Under the conditions in the average residence a dry-bulb temperature of 69.5° with relative humidity of 40 per cent is the most practical for the attainment of 65°.

Evaporation requirements to maintain a relative humidity of 40 per cent in zero weather depend on the amount of air inleakage to the average residence, and vary from practically nothing to 24 gal. of water per 24 hours. Relative humidity of 40 per cent indoors can not be maintained in rigorous climates without excessive condensation on the windows unless tight fitting storm sash or the equivalent are installed. The problems of humidity requirements and limitations can not be separated from considerations of good building construction, and the latter should receive serious attention in the installation of humidifying apparatus.

The experimental results showed that none of the types of warm-air furnace water pans tested proved adequate to evaporate sufficient water to maintain 40 per cent relative humidity in the research residence except in moderately cold weather. The water pans used in radiator shields tested would not prove adequate to maintain 40 per cent relative humidity in a residence similar to the research residence when the outdoor temperature approximates 0°.

Appendixes deal with the measurement of relative humidity and with a method of calculation for curves of humidity requirements and limitations.

## MISCELLANEOUS

**Fifty-fourth Report of the Connecticut Agricultural Experiment Station, New Haven, for the year 1930,** W. L. Slate et al. (*Connecticut State Sta. Rpt. 1930, pp. XII+764+68, pls. 20, figs. 86*).—This contains the organization list, a report of the board of control for the year ended October 31, 1930, a financial statement for the fiscal year ended June 30, 1930, and reprints of Bulletins 321–330, previously noted, and of the following circulars: Nos. 73, Connecticut Laws Concerning Plant Pests, Diseases of Bees, and Mosquito Elimination, by W. E. Britton; 74, The Japanese Beetle Quarantine; 75, Spanish Gold: Early Yellow Sweet Corn, by D. F. Jones and W. R. Singleton; 76, European Corn Borer Quarantine and Clean-up Regulations, by W. E. Britton; 77, Lawn Fertilization: Principles and Practice, by M. F. Morgan; 78, Satin Moth Quarantine, and 79. Quarantine Regulations Affecting Shipments of Connecticut Nursery Stock, 1931, both by W. E. Britton; and 80, The European Pine Shoot Moth: A Potential Enemy of Pines in Connecticut, by R. B. Friend.

**Report of the Guam Agricultural Experiment Station, 1930,** C. W. Edwards et al. (*Guam Sta. Rpt. 1930, pp. [2]+29, figs. 21*).—This contains reports of the director, the assistants in poultry husbandry, agronomy and horticulture, and extension, and the entomologist, and meteorological observations. The experimental work recorded is for the most part abstracted elsewhere in this issue. Breeding studies to produce heavier eggs are also included.

**Planning for the future of Montana agriculture: Thirty-seventh Annual Report of the [Montana Station, 1930],** F. B. Linfield (*Montana Sta. Rpt. 1930, pp. 44*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1930, a report of the director on the work and outlook of the station, and meteorological data. The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

# NOTES

**Arkansas University and Station.**—Dr. George Janssen, assistant professor of agronomy and assistant agronomist since 1926, died January 31. He was born in Wellsburg, Iowa, on June 28, 1897, and received the B. S. and M. S. degrees from the South Dakota College in 1921 and 1922 and the Ph. D. degree from the University of Wisconsin in 1925. Before coming to Arkansas he had served as assistant in agronomy in the South Dakota College and Station and the Wisconsin Station.

**Colorado College and Station.**—Dr. William P. Headden, associated with the chemical work of the station since 1894, died February 5 at the age of 81 years.

Dr. Headden was born in Red Bank, N. J., on September 21, 1850, and received the A. B. and A. M. degrees from Dickinson College in Pennsylvania in 1872 and 1875, the Ph. D. degree from the University of Giessen in 1874, and the D. Sc. degree from the University of Colorado in 1919. He was professor of chemistry in the Maryland Agricultural College from 1880 to 1884, the University of Denver from 1884 to 1889, and the South Dakota School of Mines from 1889 to 1891, and dean of the last-named institution in 1892–93.

Returning to Colorado, he became professor of chemistry and geology in the college and chemist in the station and served in these capacities until 1924, when his time was assigned exclusively to the station as chief chemist. In 1931 he was appointed soil chemist and remained in active service until shortly before his death.

Dr. Headden was a prolific writer on chemistry and mineralogy and had conducted many extensive studies. Among his best known researches were those dealing with the development of sugar in beets and the formation of nitrates in Colorado soils.

**Maryland University and Station.**—The new horticultural building (E. S. R., 65, p. 900), constructed at a cost of $150,000, was dedicated January 6.

A florists' short course was given January 26 and 27.

Dr. J. H. Beaumont, head of the department of horticulture at the North Carolina College and Station, has been appointed horticulturist, effective March 1, succeeding as head of the department of horticulture Dr. E. C. Auchter, who will continue his connection with the university as lecturer in pomology and give certain advanced and graduate courses. Ray Hurley of the Bureau of the Census, U. S. Department of Commerce, has accepted a position as assistant agricultural economist, effective March 1.

**Minnesota Station.**—According to a recent statement by the station, "crop varieties are recommended for use in Minnesota only after a thorough and comprehensive analysis of their behavior in all regions of the State. After the yields at the central station, the branch stations, and as tested in cooperation with farmers in various parts of the State have been tabulated and summarized, a court of review is held at the central station. Sitting in this court are the superintendents and agronomists of the branch stations, all members of the plant breeding staff, the plant pathologists, plant physiologists, and cereal chemists. The annual and long-time performance of each variety and group of varieties is carefully reviewed and studied. Varieties making a satisfactory record of performance over a 3-year period are advanced to a recommended list and increased for distribution. Varieties entering the commercial lists from this source are rarely disappointing in the regions for which they are recommended. This procedure, pursued now for 10 or more years, is rapidly bringing about a standardization of varieties for Minnesota conditions."

**New York State Station.**—State appropriations for general maintenance and operation of the station for 1932–33 aggregate $405,480, a decrease of $24,200 when compared with appropriations for the present fiscal year. In addition a deficiency appropriation of $3,000 for fuel, light, and power, $15,000 for repairs, and $5,000 for equipment in the new greenhouses was granted.

Two new late pears of the Bartlett type and possessing marked resistance to pear blight have been developed by the station and are being propagated and distributed by the New York Fruit Testing Association of Geneva, a nonprofit-making organization which cooperates with the station in the distribution of its new fruits. The new varieties are sister seedlings from a cross between Bartlett and Dorset and have been named Ovid and Willard.

**North Carolina College and Station.**—M. E. Gardner, pomologist, has been appointed acting head of the department of horticulture, effective March 1.

**Oregon College and Station.**—Robert Withycombe, connected with the Eastern Oregon Substation at Union since 1902 and superintendent since 1905, died in January at the age of 51 years. He was born in Portland, Oreg., graduating from the college in 1901 and subsequently studying at the University of Illinois. He was also president of the Union Livestock Association from 1910 to 1924 and mayor of Union in 1912–13.

Dale E. Richards, livestock specialist in the Montana College, has been appointed superintendent of the substation beginning March 1.

**Texas Station.**—*Agricultural Student* notes that Dr. Ivan B. Boughton has accepted an appointment as veterinarian with the substation at Sonora.

**West of Scotland Agricultural College.**—The new plant of this institution at Auchincruive near Ayr, Scotland, was formally opened in 1931 by the Duke and Duchess of York. A tract of 660 acres, a part of the estate of Auchincruive which was presented to the Scottish Government by its owner for purposes of education and research, has been assigned to the college adjoining the new Hannah Dairy Research Institute. The Dairy School for Scotland, formerly located at Kilmarnock, has been transferred to Auchincruive and reorganized, and provision has also been made for a poultry school, horticultural, beekeeping, and plant husbandry departments, dairy research in milk production and utilization, and an experiment station.

A mansion house erected on the estate in 1767 has been converted into a woman's dormitory, and a number of new buildings constructed. Prominent among these are the dairy buildings, the poultry plant, and the horticultural equipment. Research laboratories for plant husbandry are to be provided, it is anticipated, at an early date.

**New Bast Fiber Research Institute in Moscow.**—This institute was established in 1931 as a branch of the Lenin Academy of Agricultural Sciences, for the purpose of working out scientific methods for the introduction of new bast fiber plants into the Union of Socialistic Soviet Republics and mechanizing the processes of extracting fibers from such plants as ramie, kendyr, kenaf, flax, hemp, and jute. The immediate object is to study the agriculture of fiber plants, the methods of retting, decortication, degummation, and cottonization of various bast fibers, and the processes of their spinning and weaving and the utilization of waste as in paper making.

Several laboratories, experimental textile plants, and cotton mills have been organized by the institute at Moscow, as well as three experiment stations at Krasnodar, Kutais, and Tashkent and over 28 special State farms in Central Asia and the Caucasus.

The institute is publishing a monthly review, *Za Novoe Volokno* (The New Fiber), together with proceedings and other papers to promote the knowledge of new bast fiber industries. Its equipment includes a library and a museum. The entire staff numbers over 280, of whom about 150 are scientific workers and their assistants, and is headed by A. M. Krasnotchokoff.

**Research in Southern Rhodesia.**—The British South Africa Company established on April 1, 1931, a citrus experimental station with headquarters on the Mazoe Citrus Estate. A large tract of land has been allotted for the purpose, and laboratories are nearing completion. The company now owns over 50 per cent of the present citrus plantings in the colony, and plans to direct its investigations to ascertain the most desirable varieties under the local conditions, improve strains by bud selection, and study stock and scion relationships, fertilizers, plant diseases and insect pests, and transportation losses. Dr. W. J. Hall has been appointed director of the enterprise and will be assisted by a chemist, a plant pathologist, an entomologist, and a research horticulturist.

The Sand Veld Research Farm was established early in 1931 at Marandellas as the principal sand veld experiment station of the colony. A tract of 3,220 acres of land has been purchased, and 50 acres has been assigned to experimental plats. The farm has been divided into sections for tobacco research, experiments with crops other than tobacco, pasture studies, and a commercial farm. Special attention was given to the development of the experimental work during the past season.

**Allahabad Agricultural Institute, India.**—A recent letter from Principal Sam Higginbottom of this institute, described as "an American agricultural college working under the American Presbyterian Church," announces that beginning with July, 1932, it is hoped to enlarge the instruction given by adding two years to the present junior course and thereby making possible the granting of the degree of bachelor of science in agriculture. More experimental work is also contemplated. A cattle breeding experiment is already under way, breeding Holstein, Brown-Swiss, Jersey, and Guernsey bulls and four of the best local dairy breeds, Scindi, Hissar, Sahiwal, and Kankrej. The object is to establish new breeds for India which will have the ability to stand the climate and possess the resistance to disease and high digestive efficiency of the native cattle, but acquire from the foreign breeds increased milking capacity, early maturity, and bone for draft purposes. Some of these crossbred animals have been found to show little or no diminution in their milking capacity with shade temperatures running from 110 to 120° F., halfbred Jersey-Scindi heifers continuing to yield between 30 and 35 lbs. of milk daily.

Yields of from 100 to 200 tons of fresh weight of Napier grass at Allahabad and the Government farm at Dacca in Bengal are reported.

**Independent Biological Laboratories, Palestine.**—These laboratories, which were opened about two years ago at Tel-Aviv, are giving considerable attention to the biology of numerous Palestinian plants and geographical areas, the growth and variability of wheat seedlings in various salt solutions, and the physiology and biology of citrus. Courses of instruction are also being offered, including a two-year college course in agriculture, a three-term course in botany and zoology, a special course in heredity, a teachers' course in natural science, a high school course in natural science and agriculture at Petah Tikva, and lectures on agricultural topics in different localities.

**New Journals.**—The first number of *Acta Phaenologica*, a bimonthly international phenological journal, published at The Hague under the auspices of the Netherlands Society of Phenology, contains, besides an introduction explaining the need and purpose of such a journal, articles on The Field and Outlook of Phenology [trans. title], by H. Bos (pp. 11–22); The Cold Spring of 1929 in the British Isles.—I, Reaction by Insects and Birds, by J. E. Clark (pp. 23–28); The Results of the Phenological Observations at Poltava, by S. Illichevsky (pp. 29–37); and Phenology and Weeds [trans. title], by J. C. Pfeiffer (p. 38), besides miscellaneous notes. The journal is intended to serve as a medium of publication of results of phenological and related observations and investigation and for exchange of ideas on the subject, and thus to aid in promoting progress in phenology and putting it on a firmer scientific basis. It is stated that continuance of the journal after a 3-year trial period will depend upon the support it receives from contributors and subscribers.

*Die Phosphorsäure* is being issued from time to time by the scientific division of the Association of Thomas Meal Manufacturers from the offices of *Bodenkultur*, G. m. b. H., Berlin, W. 35. The initial number contains numerous reviews and the following original articles: The Physiological Significance of Phosphorus in the Upbuilding of Plant Substance, by J. Stoklasa (pp. 3–68); Observations on the Fertilizing Value of Phosphoric Acid, by A. Gehring (pp. 68–77); Farm Practice and Soil Investigations, by Goy (pp. 77–83); The Phosphoric Acid Content of Schleswig-Holstein Soils, by Sieden (pp. 83–90); The Influence of Phosphorus Fertilizers on the Profitability of Potatoes and Their Residual Value, by O. Nolte (pp. 91, 92); A Ten-Year Field Experiment in the Fertilization of Schist Soils, by Greve (pp. 93–97); The Fertilization of Pastures, by E. Goepfert (pp. 98–106); and Fertilizer Questions in Bavarian Alpine Pastures, by Schubeck and T. Ager (pp. 107–113).

**Miscellaneous.**—At the recent opening of the Massey Agricultural College on North Island, New Zealand, an address by Lord Bledisloe, governor general, pointed out that "even the most impoverished countries of the world have found public expenditure upon scientific research and the scientific guidance of their farming population to be a sound and remunerative investment."

A bronze tablet dedicated to the first boys and girls' agricultural club in the United States, organized in Springfield, Ohio, in 1902 by A. B. Graham, then superintendent of schools and now in charge of subject matter specialists in the U. S. D. A. Office of Cooperative Extension Work, was unveiled January 22.

Robert DeCourcy Ward, professor of climatology at Harvard University, who made notable contributions to climatology in general and to meteorology as applied to agriculture, died November 12, 1931, aged 64 years.

Dr. C. B. Williams, lecturer in agricultural and forest entomology in the University of Edinburgh, has been appointed head of the department of entomology at the Rothamsted Experimental Station.

J. C. Brünnich, agricultural chemist in the Queensland Department of Agriculture, has retired after a service of 34 years.

*School and Society* notes that the Barreiros Agricultural School at Pernambuco, Brazil, has been closed by the State Government to reduce expenses.

Publication of *The Agricultural Journal of British Guiana*, established in 1928, has been indefinitely suspended as an economy measure.

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# EXPERIMENT STATION RECORD

VOL. 66 APRIL ABSTRACT NUMBER No. 6

## RECENT WORK IN AGRICULTURAL SCIENCE

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**[Chemical researches of the New York State Station]** (*New York State Sta. Rpt. 1931, pp. 21, 38, 39, 40, 41, 42*).—Earlier work has been noted (E. S. R., 64, p. 409).

*Food spoilage studies.*—An unusual type of food spoilage was traced to resistant yeasts. These were found capable of fermenting a fountain sirup having a grape juice base and preserved with sugar and sodium benzoate.

*Chemical reactions of certain spray materials.*—"Both calcium and magnesium hydrate used in sufficient quantity suppress the formation of soluble arsenic, while small amounts of these hydrates increase the amount of soluble arsenic formed. Calcium and magnesium carbonates react with lead arsenate to form large quantities of soluble arsenic. Magnesium carbonates produce more soluble arsenic than calcium carbonates. Hydrates high in calcium content are superior to hydrates high in magnesium content for the suppression of soluble arsenic in lead arsenate sprays.

"Studies have been made on the rate of carbonation of hydrated lime when exposed to varying conditions of temperature and humidity. It has been found that complete carbonation may take place in a few hours or it may take days, depending on conditions of temperature and humidity. High humidities and high temperature increase the rate of carbonation, humidity being the more important factor."

*Chemical studies on grape juice.*—The quantity of dissolved pectin was found to decrease during prolonged storage. In a storage period of somewhat more than a year nearly 0.8 of the pectin disappeared, the juice finally becoming as clear as immediately after the enzymic clarification previously noted (E. S. R., 65, p. 712.) "It has been found that the uronic acids which constitute the nucleus of the pectin are still present in the grape juice, but are no longer combined in such a way as to be recognizable as a pectin compound. A study of the tartrates of grape juice has shown that potassium and tartaric acid are present from the beginning in the requisite quantities for forming the insoluble potassium acid tartrate."

*Effects of salts on proteins.*—The conclusion of a series of experiments on the effect of potassium salts on the optical activity of gelatin (E. S. R., 58, p. 610) is noted. The data now made available "have indicated that the seat of this change in constitution is probably in the 'zwitter-ion' portion of the protein molecule. Contrary to the conclusions of Loeb, the salts arrange themselves as to this effect in the usual Hofmeister series."

*Pectin from stored apple pomace.*—In an investigation of the pectic constituents of stored dry apple pomace, storage with a moisture content as low as 7.5 per cent was found to decrease the amount of acid hydrolyzable pectin (protopectin) and resulted in a lower yield and quality of pectin. This decrease in the pectin content of apple pomace was shown to be the result neither of enzymatic reaction nor of mold contamination.

**The nonprotein nitrogen of the Alaska pea, with special reference to the chemical nature of humin nitrogen,** S. L. Jodidi (*Jour. Agr. Research [U. S.], 43 (1931), No. 9, pp. 811–825*).—Alaska pea seeds grown at Arlington Experiment Farm, Virginia, on soil treated with muriate of potash at the rate of 300 lbs. per acre and on untreated soil were found to differ in their contents of nonprotein nitrogen. In the potash-supplied and nonpotash peas the percentages of acid amide nitrogen were 11.4 and 7.6; humin nitrogen formed on hydrolysis of the acid amides 6.7 and 10.5; amino nitrogen 6 and 8.4; peptide nitrogen 37.6 and 41.8; and humin nitrogen formed on hydrolysis of the polypeptides 21.5 and 11.7, respectively.

Since the sum of the more or less nutritive constituents, namely, amide, amino, and peptide nitrogen, was 55.1 and 57.8 per cent in the two lots of peas, the author concludes that there is no essential difference in the nutritive value of such peas in so far as nonprotein nitrogen is concerned.

Humin nitrogen from the hydrolysis of acid amides was found to be split by hydrolysis with hydrochloric acid into a soluble portion containing 61 per cent of the total humin nitrogen in soluble form and into an insoluble portion with 41.4 per cent of residual humin nitrogen. A total of about 32 per cent of the total humin nitrogen was converted into amino nitrogen by the hydrolysis. The actual percentage of amino nitrogen is believed to be higher. The obtaining of amino nitrogen from pea materials by simple hydrolysis is believed to indicate peptide linkings.

**The hydrotropic solution of calcium with relation to the solution of calcium in the blood serum** [trans. title], A. von Kúthy and H. Banga (*Biochem. Ztschr., 230 (1931), No. 4–6, pp. 458–465, figs. 2*).—Hydrotropic solutions of calcium in sodium salicylate solutions were investigated and compared with the state of the calcium in the blood serum. In both cases the calcium in the solution was found in part ionized, in part combined in negatively charged, undiffusible complexes. The opinion is expressed that the calcium of the blood serum is also in hydrotropic solution.

**The effect of hydrogen-ion concentration on the toxicity of several preservatives to microorganisms,** W. V. Cruess, P. H. Richert, and J. H. Irish (*Hilgardia [California Sta.], 6 (1931), No. 10, pp. 295–314, figs. 2*).—In the pH ranges 5 to 9 much higher concentrations of sodium benzoate, sodium salicylate, potassium acetate, and sodium sulfite were required to prevent the growth of yeasts, molds, and bacteria than at pH values within the range 2.0 to 4.5. The effect of the same preservatives on the rate of fermentation was affected by the pH value similarly but to a lesser degree.

Of sodium chloride and of formaldehyde, the preservative and fermentation retarding concentrations with respect to *Saccharomyces ellipsoideus* were altered by pH values only slightly within the pH range of the experiments here recorded.

In the case of sodium benzoate, more than 200 times as much of the preservative was required in some instances at neutrality as at pH 3.0 or at higher acidities.

**Cane-sirup manufacture,** J. O. Carrero (*Porto Rico Sta. Rpt. 1930, pp. 13, 14*).—"The use of lime alone or lime and phosphates always improved the clarity of the sirup, but the color was darker than that of sirup from untreated juice. Addition of citric or tartaric acids to defecated juice brought further improvement in clarity, color, and tendency to crystal formation in the sirup. . . . The product obtained by the use of citric and tartaric acid was a clear, light-colored sirup, agreeably flavored, and of slightly acid taste. Tartaric acid has an advantage over citric acid since tartrates of lime and potassium are of slight solubility and crystallize out, leaving a reduced acidity, whereas the citrates of these salts are soluble."

**A dry method of microanalysis of gases,** F. E. Blacet and P. A. Leighton (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 266–269, fig. 1*).—"An apparatus for microanalysis of gases has been described," in this contribution from Stanford University, California, "and a method worked out for the analysis of gas samples of the order of 25 to 100 cu. mm. without the use of liquid reagents."

Yellow phosphorus was used to remove oxygen, fused potassium hydroxide to remove carbon dioxide, and fused phosphorus pentoxide to remove water vapor. These absorbents were used also in the analysis by combustion of hydrogen, carbon monoxide, and methane. The results of the analysis of a number of different samples "indicate that the degree of precision to be expected by this method is of the same order of magnitude as that ordinarily attained in macroanalysis of gases."

**The problem of dilution in colorimetric H-ion measurements.—II, Use of isohydric indicators and superpure water for accurate measurement of hydrogen-ion concentrations and salt errors,** S. F. Acree and E. H. Fawcett (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 78–85, figs. 3*).—It is shown in this contribution from the U. S. Bureau of Standards and the U. S. D. A. Bureau of Plant Industry that precision pH data in very dilute or weakly buffered solutions can be obtained colorimetrically only by (a) the adjustment of the pH of the standard indicator solutions, (b) the use of the isohydric indicator methods, (c) the use of superpure pH 7.0 water, and (d) the correction for the salt and protein errors.

"A method is given for the adjustment of the pH of the indicator standards against 0.001 M or 0.05 M buffer color standards. The technic for the use of the isohydric indicator method is described. The production, test, storage, and use of superpure water in precision pH work are described. Tables and curves are given to show the errors in pH caused by dilution of buffers with ordinary pH 5.0 distilled water and with pH 5.7 air-$CO_2$ equilibrium water. Electrometric and colorimetric data are presented to show the relation between the dilution of buffers and the salt and protein errors of the indicators used."

**Use of wide-range indicators for determination of pH,** F. R. McCrumb (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 233–235*).—"It has been shown that accurate pH determinations can not be made on slightly buffered materials with a wide-range indicator [the mixture actually used consisting of methyl red 0.02 per cent, bromothymol blue 0.04, thymol blue 0.04, and phenolphthalein 0.02 per cent in alcohol 60 per cent by volume] when the determinations are carried out with a single solution which may vary considerably in pH from the material being tested. . . . Although fairly accurate results can be secured by using a number of solutions of a wide-range indicator adjusted in steps of 1.0 pH according to the isohydric method, such a procedure offers no advantage over the use of several short-range indicators, with the disadvantage that a wide-range indicator is rarely so sensitive as several short-range indicators used separately, because the color changes are not so distinct."

**Accurate and adaptable micro-Kjeldahl method of nitrogen determination,** W. F. Allen (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 239, 240, fig. 1*).—The author presents as a contribution from the Michigan State College a description and the manipulative detail of a small-size Kjeldahl apparatus found easier of construction and more convenient in operation than the usual forms of miniature Kjeldahl set-up. Boric acid was successfully used for the absorption of ammonia.

**Use of boric acid in micro-Kjeldahl determination of nitrogen,** N. M. Stover and R. B. Sandin (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 240–242*).—Report is made from the University of Alberta, Canada, of an investigation in which "the use of boric acid in absorbing ammonia in nitrogen determinations by Pregl's micro-Kjeldahl method has been found to give accurate results. The distillate containing the ammonia does not need to be boiled before titrating. A mixed indicator containing methyl red and tetrabromophenol blue has been found to give good results in boric acid solution."

**Microscopic examination of precipitates as an aid to precise analysis.—I, Estimation of sulfates as barium sulfate,** S. Popoff and E. W. Neuman (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 45–54, figs. 10*).—With reference to the microscopic characteristics of the precipitates, the authors note that "the photomicrographs of barium sulfate obtained under varying conditions and methods show that the reverse method [i. e., adding the sulfate to the acidified barium chloride solution] gives in practically all cases more uniform . . . crystals than other recommended methods. This feature is not surprising in view of the fact that the environment is more clearly alike in the reverse method."

A considerable group of quantitative data support the indications of the observations of crystalline state and show further that "the usual method, as well as most of the recommended methods, gives results that are very much lower (over 1 per cent in the case of potassium sulfate) than the theoretical. The lower results may be attributed to the preferential adsorption of the sulfate ions rather than of the chloride ions. The reverse order of precipitation of barium sulfate is also to be preferred in the presence of salts including large concentration of ammonium chloride or ferric chloride. Neither the reverse nor regular methods can be employed in the presence of potassium nitrate.

"The chloride contamination is greater in the reverse method than in the usual methods. This greater contamination does not condemn the reverse method, as the contamination is practically offset by the solubility of barium sulfate.

"There appears to be progressive loss on heating up to 950° C. the barium sulfate obtained by either the regular or reverse method."

**Apparatus for destructive oxidation of organic material in the determination of metals in foods,** J. W. Barnes (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 107, 108, figs. 3*).—The author reports as a contribution from the Bureau of Chemistry and Soils, U. S. D. A., the device of a battery arrangement in which provision is made for the efficient removal of fumes by inserting the mouth of each flask into an opening of a size just sufficient to admit it in the side of a tube of glass, terra cotta, or acid-resistant iron, 10 cm. in diameter and in the author's apparatus 127 cm. long, this tube being connected to the draft flue. For a convenient common acid supply, feeding by gravity to a horizontal tube running the length of each row of flasks and through vertical branches from the horizontal main to the mouth of each flask, a stopcock on each individual outlet permits independent control of the acid supply rate to each flask, and a notch in the mouth of each flask admits the acid feed tube without interference with the proper position of the flask in the fume duct. Simpler equipment convenient for the carrying out of occasional small groups of oxidations is also described, the design of both types of set-up being fully illustrated by diagrams.

**Copper determination in organic matter,** S. Ansbacher, R. E. Remington, and F. B. Culp (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 314-317*).—"Organic matter can be destroyed without loss of copper in small samples by wet combustion, using sulfuric acid, perchloric acid, and fuming nitric acid. Larger samples can be burned in silica dishes at a temperature not above 400° C., followed by treatment with fuming nitric acid. The use of ammonia to remove iron and other metals leads to results which are too high. Precipitation of copper by hydrogen sulfide is quantitative if acid concentration is properly controlled, some sulfur is precipitated with the copper, and suitable precautions are taken in the filtration, washing, and re-solution of the precipitate.

"On the solutions so prepared, the xanthate reagent tends to give high results, the error being least if from 100 to 200 $\gamma$ of copper are present in the solution. The carbamate reagent is applicable to solutions containing about 50$\gamma$ of copper, giving results agreeing very closely with those obtained by the chromotropic reagent, which can be used to estimate quantities as small as 2 or 3 $\gamma$ with an accuraacy of 0.5 $\gamma$. The Biazzo reagent is most reliable for 50 to 150 $\gamma$ of copper, but tends to give results which are slightly low."

**Quantitative separation of copper and cadmium by reduction of their salts with potassium formate,** E. I. Fulmer (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 257, 258*).—The formates of lead, copper, and cadmium were observed by the author of this contribution from the Iowa State College to yield the free metal on heating with or without some carbonate. Zinc formate yielded the oxide. Sodium formate evaporated to dryness with solutions of various salts of a number of metals effected on heating the dry mixture a reduction to the free metal in most cases. For the quantitative separation of copper from cadmium, however, potassium formate was the more successful, 15 gm. of the formate being added to 2 gm. of the mixed salts. Under the experimental conditions set up in the work here noted, potassium formate reduced the copper to the metallic state at 100° C., the cadmium not until the temperature was raised to 200°. In 1.5 hours at 155 to 160°, these mixtures yielded the copper quantitatively as the metal, the cadmium passing quantitatively into the filtrate. The copper was washed with hot water, then with alcohol, and with ether. The reduced metal was in a spongy condition and care was required to prevent oxidation.

**Accuracy of the Gutzeit method for the determination of minute quantities of arsenic,** J. W. Barnes and C. W. Murray (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 29, 30, fig. 1*).—The authors here place on record "the order of magnitude of the error of the Gutzeit method" as determined by them at the Bureau of Chemistry and Soils, U. S. D. A. "Owing to the sensitiveness of this method, however, each laboratory using the method frequently should determine its own probable error.

"Observation of variations in the Gutzeit strips and application of statistical methods lead to the conclusion that when applied under ordinary commercial conditions, that is, in the absence of extraordinary precautions to control physical conditions, etc., the probable error of the mean of duplicate strips in the Gutzeit method is ±0.0039 mg. Thus, for quantities from 35 micrograms down, the error ranges from 11 to 100 per cent, when the reference is a series of single aliquots from the standard solution.

"Where a graph has been prepared from a large number of aliquots from a standard solution, this error may be reduced. Take sets of, say, 20 aliquots at steps of 10, 20, 30, 40 micrograms. Plot the arithmetic means of these determinations. Use this graph as the reference, or, preferably, calculate the equation of the line and prepare a table of the values of the stains of different lengths. The probable error of the method becomes ±0.0023, which is 7 per cent to 100 per cent for the range discussed.

"If the total arsenic is more than 4 mg., necessitating an aliquot of less than 0.01 to come under 40 micrograms, the calomel method should be used.

"There is no loss of arsenic in the process of oxidation, etc., even when charring takes place."

**Rapid volumetric method for the determination of lead, R. C. Wiley** (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 124–126*).—"The basis for the following method [from the University of Maryland] for the determination of lead is Alexander's molybdate method. In the past when lead salts have been titrated against ammonium molybdate, tannic acid has been largely used as an indicator to determine when an excess of the molybdate was present. . . . In the method here described, a mixture of stannous chloride and potassium thiocyanate dissolved in water is used" as an outside or spot plate indicator with the appearance of a red color as the index of the presence of the molybdate ion.

**A reductor apparatus for detecting tin, J. H. Reedy** (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 117, 118, fig. 1*).—Equipment and manipulative details of a method for detecting the presence of small quantities of tin by reduction with lead to the stannous condition and testing with mercuric chloride in a simple modification of the Jones reductor are given in a contribution from the University of Illinois.

"Except for interferences by a few anions, this test for tin is specific, and can be used on the original solution with only a slight loss in sensitiveness. Among the cations, $Cr^{+++}$ and $Ni^{++}$ are probably the most undesirable, since their color seems to obscure a faint mercuric chloride reaction. The metals occurring below hydrogen in the e. m. f. series are completely precipitated in the upper layers of the lead and, beyond increasing the amount of lead chloride that may go into the filtrate, are without effect. One mg. of tin in the presence of several hundred milligrams of copper, silver, etc., is easily detected. Even the combination of mercuric and stannic chlorides causes no complications. The mercury is completely precipitated in the upper layers of the column without any perceptible formation of mercurous chloride." Interferences by certain anions are described, but "all of these interferences may be obviated by first evaporating the solution to dryness with an excess of hydrochloric acid. By this treatment these interfering anions are either expelled or destroyed, and in this way the test becomes available for solutions in general."

**Determination of carbon dioxide in carbonates, W. W. Scott and P. W. Jewel** (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 76, 77, figs. 2*).—The authors describe and illustrate an apparatus and procedure for a simple and rapid determination of carbon dioxide by the loss-of-weight method. Provision is made for the prevention of loss of moisture during the aeration required to remove residual carbon dioxide. The apparatus is an assembly of materials generally available. The time required for the determination is given as about 20 minutes and the error was found to be about 0.1 per cent.

**Method for analysis of volatile compounds containing carbon, hydrogen, and nitrogen, W. Scholl and R. O. E. Davis** (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 276–278, fig. 1*).—A method for the analysis of mixtures of gases containing ammonia, carbon dioxide, and water vapor, with the use of solid absorbents whereby samples of a few milligrams may be analyzed accurately by measurement of volumes at reduced pressures, has been developed by the Fertilizer and Fixed Nitrogen Investigations, Bureau of Chemistry and Soils, U. S. D. A.

"The method was also employed to determine nitrogen, hydrogen, and carbon in volatile organic materials whose products of combustion are composed of water vapor, carbon dioxide, and nitrogen. The method can be employed with accuracy where samples are too small to obtain accurate results by the ordinary method of determining the increase in weight of absorptive materials."

A description of the apparatus is given, and the procedure in analyzing gases and liquids is outlined.

**Analysis of three hydrocarbons by combustion, K. A. Kobe** (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 262–264*).—The author of this contribution from the University of Minnesota shows that relations considerably simpler than those ordinarily used in the calculation of gas analysis data "can be deduced from the general formulas of any three hydrocarbons by the use of determinants, avoiding the necessity of fixing the class and series of which the gas is a member. It is not necessary that the gas be a hydrocarbon, since values for other gases can be inserted into the formula with the same result . . . . If nitrogen is not present in the mixture or is determined by actual difference, the calculations can be made from the volume of gas used, the volume of carbon dioxide formed, and the contraction in volume occurring on combustion."

The algebraic solutions of general cases are shown.

**Determination of dextrose in the presence of levulose, D. T. Englis and W. J. Byer** (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 121, 122*).—"A study has been made [at the University of Illinois] of the iodometric oxidation of dextrose and a dextrose-levulose mixture to establish the best conditions for the determination of the former in the presence of the latter in the proportions found in artichoke and chicory sirups. It was found that these conditions are fulfilled by using a sodium carbonate-borate buffer of pH 10.6 and about three times the calculated amount of iodine, which gives an apparent stoichiometric oxidation of dextrose to gluconic acid in the presence of four times the amount of levulose in 20 minutes at 26–27° C. . . . Borates did not seem to exert a selective inhibition on the oxidation of levulose. The rate of oxidation of the dextrose and dextrose-levulose mixtures beyond the apparent stoichiometric point is shown for the borate buffer and for 1.5 per cent sodium carbonate."

**A photochemical method for measuring susceptibility of fats and oils to oxidation, G. R. Greenbank and G. E. Holm** (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 9, 10, figs. 3*).—The authors of this contribution from the Bureau of Dairy Industry, U. S. D. A., find that "the rate of reduction of methylene blue in a fat or oil when catalyzed by light may serve as a measure of the rate of reaction of the initial oxidative processes and may, therefore, be utilized to determine the relative susceptibilities of fats and oils to oxidation." An apparatus devised for measurement of the time required for the completion of the reaction to a standard end point provides essentially for allowing the light used to catalyze the reaction to pass through the sample mixture of the fat with the dye, and then to fall upon a photoelectric cell of which the sensitivity is so adjusted that a relay signal device is operated at the required degree of fading of the methylene blue content of the sample mixture. The correct manipulation of this apparatus and the manner in which the results are interpreted are illustrated. Results agreeing closely with those obtained by direct measurement of oxygen absorption are shown.

**A large-scale Soxhlet extractor,** S. A. Lough (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, p. 344, fig. 1*).—"In order to obtain large quantities of an oil for analysis, the extractor described . . . was devised [at the University of Nevada]. It lends itself readily to adaptation to special problems and can be made from materials found in almost every laboratory." The apparatus is of the intermittent, siphoning type and employs a 2-liter solvent flask. Its constructional details are shown in a drawing accompanying the note.

**Clarification of plant juices** (*Virginia Sta. Rpt. 1928–1931, pp. 26, 27*).—In connection with the use of the juice of corn plants as an index of plant food requirements,[1] "It has been found that in evaporating the clarified portion of the juice extreme care must be exercised so as not to allow the solution to bake on the water bath. The portion for analysis should be evaporated so that the solution just moves in the dish when it is rotated. When adding the phenoldisulfonic acid the dish containing the portion for analysis should stand on a beaker containing cold water, preferably crushed ice. This point must also be observed when developing the yellow color with ammonia water." When the precaution to allow as little heating as possible during the entire process was neglected, there was found to be danger of the development of brown tints capable of obscuring the yellow color upon the measurement of which the nitrate determination depends.

**Use of protective colloids in colorimetric determination of certain metals as lakes of dyes,** W. E. Thrun (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 1, pp. 8, 9*).—"It is the purpose of this paper to call attention to the value of gum arabic and, particularly, to starch glycerite as protective colloids for dilute lake solutions. . . .

"*Aluminum lake of aurintricarboxylic acid.*—Gum arabic is effective. Starch glycerite is not effective, at least in small quantities.

"*Aluminum lake of alizarinsulfonic acid.*—Gum arabic in small quantities is ineffective. If approximately 7 cc. of a 2 per cent solution of the gum is added, before the lake solution is made acid, and the solution made up to 50 cc. in a tall Nessler tube, upon standing several weeks part of the lake settles toward the bottom, while the remainder rises toward the top. Starch glycerite solution (1–2 cc. per 50 cc.) will keep the lake in solution unless heat is used during the lake formation.

"*Beryllium lake of curcurmin.*—Starch glycerite (1 cc. per 12 cc. final volume) causes a very decided increase in color intensity. The presence of this colloid makes the Kolthoff method for detecting and determining small quantities of beryllium more sensitive and accurate.

"*Magnesium lake of curcurmin.*—Starch glycerite (1 cc. per 12 cc.) retards the rate of settling of the lake. The lake which is formed in the presence of the colloid remains for days, while the unprotected lake gradually disappears. Other lakes not mentioned specifically in the literature, such as the alizarinsulfonic acid lake of the ferric hydrous oxide, were found to be kept in solution by starch glycerite. Lakes of oxides other than aluminum oxide formed by the adsorption of aurintricarboxylic acid are kept in solution by gum arabic."

**Quantitative estimation of amaranth and tartrazine in a food color mixture,** O. L. Evenson and R. H. Nagel (*Indus. and Engin. Chem., Analyt.*

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[1] Plant Juice Clarification for Nitrate Nitrogen Determinations, H. H. Hill. Science, 71 (1930), No. 1847, p. 540.

*Ed., 8 (1931), No. 3, pp. 260–262, fig. 1).*—In this contribution from the Food and Drug Administration, U. S. D. A., it is shown that "a quantitative estimation of certain food dyes, especially amaranth and tartrazine, which have practically the same solubility in organic solvents and, therefore, can not be separated by the extraction method, may be made by employing selective reduction. In a mixture of amaranth and tartrazine, the amaranth is reduced by ammonium sulfide, leaving the tartrazine, which is then estimated by means of titanium trichloride. Another method, based upon spectrophotometric measurements, is also given."

## METEOROLOGY

**At what hour is rainfall the heaviest?** L. A. DENSON (*Jour. Elisha Mitchell Sci. Soc., 47 (1932), No. 1, pp. 70–73, figs. 2*).—From hourly records of precipitation for 26 years at the Weather Bureau station at Raleigh, N. C., which is considered fairly representative of conditions in the Piedmont and upper Coastal Plain regions of the State, a table and a graph were prepared which show that "for the year as a whole the heaviest rainfall occurs in the hour ending at 4 p. m. (5.6 per cent). . . . The least is at 1 a. m. (3 per cent) followed next by 9 a. m. and other later hours of the forenoon. Nearly twice as much rain occurs at 4 p. m. as at 1 a. m. It is also shown that the amount is much heavier in the last than in the first 12 hours, the afternoon showing about 39 per cent increase over the forenoon. Another interesting point is that the amount of precipitation from 6 a. m. to 6 p. m. is equal to the amount from 6 p. m. to 6 a. m."

There was found to be an outstanding difference between the heavy afternoon rains of summer and those of the latter half of the night in winter. "All months from November to March show more rain at night than during the daytime. October is also inclined toward the night, but April showers are more equally distributed." The value of such information as a basis for planning "out-of-door work and sports in the forenoon from May until September and in the afternoon from October to March" is suggested.

**Climatological data for the United States by sections, [June–August, 1931]** (*U. S. Dept. Agr., Weather Bur. Climat. Data, 18 (1931), Nos. 6, pp. [205], pls. 3, figs. 4; 7, pp. [205], pls. 2, figs. 5; 8, pp. [205], pls. 2, figs. 5*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for June, July, and August, 1931.

**Meteorological observations, [November–December, 1931],** C. I. GUNNESS and K. M. WHEELER (*Massachusetts Sta. Met. Ser. Buls. 515–516 (1931), pp. 4 each*).—Summaries of observations at Amherst, Mass., during November and December, 1931, and normals and extremes for the period 1889 to 1930, inclusive, are given.

The December number contains an annual summary for 1931, which shows that the mean pressure for the year was 29.96 in.; the mean temperature 49.4 F., highest 96° August 7, lowest —11° February 3; total precipitation 45.18 in., as compared with the normal of 43.49 in.; snowfall 44 in., as compared with the normal of 48.38 in.; mean cloudiness 57 per cent, bright sunshine 48.3 per cent; last frost in spring May 4, first in fall October 10; last snow April 8, first November 27. There were no pronounced departures from normals.

**Meteorological records, 1883 to 1930** (*New York State Sta. Rpt. 1931, pp. 111–122*).—Tables are given which summarize, by months and years, maximum, minimum, and mean temperature and precipitation at Geneva, N. Y.

## SOILS—FERTILIZERS

**[Soil Survey Reports, 1927 Series]** (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1927, Nos. 21, pp. 61, pls. 2, figs. 2, map 1; 22, pp. 29, fig. 1, map 1; 23, pp. 30, fig. 1, map 1; 24, pp. 58, pls. 2, fig. 1, map 1; 25, pp. 34, pls. 3, fig. 1, map 1; 26, pp. 30, fig. 1, map 1; 27, pp. 29, pls. 2, fig. 1, map 1; 28, pp. 44, fig. 1, map 1; 29, pp. 38, fig. 1, map 1*).—The survey reports here noted were prepared with the respective cooperation of the Texas Experiment Station, the Kansas Experiment Station, the Maryland Geological Survey and the Maryland Experiment Station, the Indiana Experiment Station, the Kansas Experiment Station, the Maryland Geological Survey and the Maryland Experiment Station, the Colorado Experiment Station, and the Michigan Experiment Station and the Michigan Department of Conservation.

No. 21. *Soil survey of Victoria County, Texas*, W. T. Carter et al.—Victoria County, 560,000 acres in south-central Texas, forms part of a broad, nearly flat belt of the Gulf coast prairie. The drainage over considerable areas was found not good, but much land is artificially drained.

The soils are grouped in 18 series of 30 types, of which Lake Charles clay, 21.1 per cent of the total acreage, Edna fine sandy loam covering 20.7 per cent, and Hockley fine sandy loam, which occupies 14.8 per cent, are the more extensive.

No. 22. *Soil survey of Wilson County, Kansas*, J. A. Kerr et al.—Wilson County occupies 368,000 acres in southeastern Kansas, comprises a series of plains increasing westward in elevation, and has drainage ways to two rivers, so that all of the upland portion is well drained.

Parsons silt loam amounts to 15.4 per cent of the entire soil area, Bates loam following with 10.7 per cent, with 7 other series showing 20 types.

No. 23. *Soil survey of Cecil County, Maryland*, S. O. Perkins and W. H. Moore.—Cecil County, in the extreme northeastern corner of the State, takes up 227,200 acres and extends into parts of the two physiographic regions of the Piedmont plateau and the Coastal Plain, natural drainage being to Chesapeake Bay.

The soils mapped and described comprise 11 series represented by 21 types, of which the more extensive are Chester loam, forming 20.2 per cent of the area surveyed, Sassafras loam 13.6 per cent, and Sassafras silt loam 13.1 per cent. Meadow, 1.7 per cent, rough stony land 0.4 per cent, and 1.7 per cent of tidal marsh, unclassified, were also found.

No. 24, Part 1. *Soil survey of Miami County, Indiana*, W. E. Tharp and D. R. Kunkel (pp. 1–42).—Miami County, north-central Indiana, has an area of 241,920 acres, its surface features ranging from those of a plain in the southern half of the county to a more undulating and in part somewhat hilly topography in the northern half. Ditches and tile have provided adequate drainage in sections not fully drained by natural streams.

Of the soils classified as 28 types of 15 series, Crosby silt loam is the most extensive, covering 23.3 per cent of the total area, Brookston silty clay loam following with 19.1 per cent, Miami silt loam with 15.1 per cent, and Miami loam with 11.1 per cent.

No. 24, Part 2. *The management of Miami County soils*, A. T. Wiancko and S. D. Conner (pp. 43–58).—This section deals with the chemical composition and management of Miami County soils.

No. 25. *Soil survey of Doniphan County, Kansas*, E. W. Knobel et al.—Doniphan County, lying in the northeastern corner of Kansas, occupies 245,120 acres of somewhat modified plateau lands, very generally well drained.

Of the 24 types of 12 series of soils mapped and described, Knox silt loam leads in areal extent with 23.1 per cent of the entire area. Marshall silty clay loam occupies 19.8 per cent, Marshall silt loam 15.7 per cent, and the remaining classified types, areas of minor extent. River wash, unclassified, was found to the extent of 2.0 per cent.

No. 26. *Soil survey of Harford County, Maryland*, S. O. Perkins and H. B. Winant.—Harford County, northeastern Maryland, includes 282,880 acres, of which about four-fifths lies in the Piedmont plateau region, the remaining one-fifth in the Coastal Plain, drainage being provided by a number of rivers including the Susquehanna. The upland parts of the county were found to be well drained.

The three soil types of major extent, Chester loam, Manor loam, and Montalto clay loam together occupy, respectively, 35.8, 13.6, and 11.5 per cent. In all, 16 types, assigned to 10 series, are mapped and described. Meadow to the extent of 0.4 per cent, and tidal marsh amounting to 2.7 per cent are listed unclassified.

No. 27. *Soil survey of the Fort Collins area, Colorado*, A. T. Sweet and J. N. Spencer.—The Fort Collins area, north-central Colorado, has an extent of 290,560 acres and lies at the western edge of the Great Plains. Its lands form a fairly smooth eastward sloping plain dissected by three small rivers having wide flood plains. The greater part of the area is under irrigation.

Of the soils of the area the more extensive are Weld loam, of which 14.8 per cent is mapped and described, and Cass fine sandy loam, which amounts to 10.1 per cent of the total acreage. Rough mountainous land to the extent of 16.9 per cent was also found, and the classified soil types number 26, distributed among 9 series.

No. 28. *Soil survey of Kalkaska County, Michigan*, J. O. Veatch et al.—Kalkaska County lies in the northwestern part of the southern peninsula of Michigan, its land area being 357,760 acres and its physiographic features those of a glaciated plain. About 70 per cent of the total area of Kalkaska County was found to be naturally well drained. The report lists 25 series of soils, represented by 30 types. Rubicon sand, with 18.8 per cent of the total area, is followed by Kalkaska loamy sand, of which 15.8 per cent was found, and Emmet sandy loam, amounting to 12.1 per cent.

No. 29. *Soil survey of Crawford County, Michigan*, J. O. Veatch et al.—Crawford County, with an area of 359,040 acres, is located in the northern part of the lower peninsula of Michigan, its lands forming a part of the great glaciated plain of the Great Lakes region. Drainage throughout about 87 per cent of the area is good.

Of 25 types assigned to 20 soil series, 31.4 per cent of Grayling sand, 27.1 per cent of Roselawn sand, and Rubicon sand amounting to 10.7 per cent are the more prominent in aggregate area among the soils mapped and described.

**[Soil Survey Reports, 1928 Series]** *(U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 8, pp. 32, fig. 1, map 1; 11, pp. 28, fig. 1, map 1; 12, pp. 34, fig. 1, map 1; 13, pp. 22, fig. 1, map 1)*.—The four reports here noted were prepared with the respective cooperation of the North Carolina Department of Agriculture and the North Carolina Experiment Station, the Georgia State College of Agriculture, the University of Nebraska, and the Maryland Geological Survey and the Maryland Experiment Station.

No. 8. *Soil survey of Martin County, North Carolina*, S. O. Perkins and S. R. Bacon.—Martin County is a tract of 296,960 acres of "flatwoods" lands, for the most part a flat plain, though with undulating to rolling sections near the streams, in northeastern North Carolina. About one-third of the county is without natural drainage.

Of the 21 soil types here classified as 14 series, Norfolk fine sandy loam, 18.8 per cent, exceeds in area the extensive swamps, which constitute 18.1 per cent of the entire county, and Coxville very fine sandy loam, 11.8 per cent.

No. 11. *Soil survey of Cook County, Georgia*, J. W. Moon and A. L. Gray.—Forming an area of 147,200 acres in southern Georgia, Cook County has surface features of "a comparatively smooth plain modified by shallow valleys and a few so-called lime sinks," with surface drainage ranging "from very poor to excellent."

The soils are grouped into 11 series and 17 soil types. Plummer loamy fine sand, 23.1 per cent of the total area, Tifton fine sandy loam 15.6 per cent, Norfolk fine sandy loam 14.2 per cent, 11.2 per cent of unclassified swamp, and 5.6 per cent of peaty muck, unclassified, are the leading soils.

No. 12. *Soil survey of Saline County, Nebraska*, F. A. Hayes et al.—Saline County occupies 366,720 acres of a broad, for the most part, nearly level plain in the southeastern section of the State. Drainage is from well to fairly well established.

The soils of the area are classified into 14 series of 19 types. Hastings silt loam leads in areal extent with 38.9 per cent of the total area, Crete silt loam follows with 20.5 per cent, and Carrington silt loam occupies 11.4 per cent.

No. 13. *Soil survey of Calvert County, Maryland*, S. O. Perkins and M. Hershberger.—The area of 139,520 acres occupied by Calvert County, southern Maryland, constitutes in general a well dissected upland plain with a narrow, less dissected flat river terrace. "The original plain has been thoroughly dissected, and drainage is excessive."

The 10 soil types are classified as 5 series, of which sassafras fine sandy loam with an aggregate area of 45.9 per cent, and sassafras sandy loam, with 33.2 per cent, predominate. Coastal beach, meadow, and tidal marsh, unclassified, form 7.6 per cent of the county.

[**Soil Survey Reports, 1929 Series**] (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpts.*], *Ser. 1929, Nos. 1, pp. 22, fig. 1, map 1; 2, pp. 27, pls. 2, fig. 1, map 1*).—The two reports here noted cover surveys made with the cooperation, respectively, of the North Carolina Department of Agriculture and the North Carolina Experiment Station, and the New Mexico Experiment Station.

No. 1. *Soil survey of Gates County, North Carolina*, W. A. Davis and R. E. Devereux.—In general the surface relief of Gates County, 217,600 acres in size and situated in northeastern North Carolina, is level, undulating, and gently rolling, with many small swamps and slight depressions. Though most of the land can be drained by canals and open ditches, only about one-third of the county is naturally well drained. Of this area peat and swamp, unclassified, occupy 25 per cent, Lenoir very fine sandy loam 18.9 per cent, and Craven fine sandy loam 14.3 per cent, together with 12 other types of 5 series. It is noted that "perhaps not more than 30 per cent of the soils, not including peat and swamp, in Gates County are under cultivation."

No. 2. *Soil survey of the Socorro and Rio Puerco areas, New Mexico*, E. N. Poulson and E. G. Fitzpatrick.—The two discontinuous tracts of which the survey is recorded in the present report have an area combined of 74,240 acres in west-central New Mexico, and comprise chiefly first bottom and alluvial lands. Irrigation is required.

In these two areas were found 5 soil series represented by 18 types, Gila fine sandy loam, of which 12.1 per cent is mapped, being the most extensive. The unclassified material found consisted of 7.2 per cent of rough broken land and river wash 6.9 per cent.

**[Studies with soils and fertilizers, Arkansas]** (*Arkansas Sta. Bul. 268* (*1931*), *pp. 25, 26, 27, 28*).—Earlier work has been noted (E. S. R., 64, p. 416).

*Effect of potassium on the production of protein, sugars, and starch in the cowpea and the sugar beet plants with its relation to plant growth*, G. Janssen and R. P. Bartholomew.—Dealing with the relation of high and low potassium contents in nutrient solutions, both to sugars, starches, and nitrogen distribution, and to histological indices in cowpea and sugar beet plants, the authors conclude (1) that the greater percentage of potassium was taken up by plants given the larger concentrations of potassium (E. S. R., 65, p. 721); (2) that cowpea plants grown at low potassium concentrations usually had lower starch contents but higher contents of total and of reducing sugars; (3) that the total nitrogen intake of plants in the low potassium solutions was greater, the soluble nitrogen showing the same relation with but two exceptions; (4) that the amino nitrogen was nearly always higher at the lower potassium concentrations; (5) that the high sugar content and relatively high nitrogen content of the low potassium plants were usually accompanied by high amino acid production; (6) that, among histological indications, heavy cell walls, and in general a greater development of sclerenchyma cells and wood fibers, and a lesser development with respect to both number and size of cortex cells, were associated with the lower potassium concentrations; and (7) that "in the sugar beet it appears that the cell walls of the mechanical tissue in the vascular system are thicker and more numerous in the low-potassium plants than in the high-potassium plants; also the pericycle activity was reduced in the former plants."

*Effect of the amount of calcium in the nutrient solution upon the absorption of potassium by plants*, G. Janssen and R. P. Bartholomew.—The potassium concentration was maintained at 10 parts per million, and the calcium concentration was increased from 1 to 200 parts per million. Soybean plants and Sudan grass were used as test plants.

No definite relation between calcium concentration in the nutrient solution and the uptake of potassium by the plants could be demonstrated. "The results of potassium analyses of plants show no consistent relationship between percentage potassium in the plant and the amount of calcium which was maintained in the nutrient solution." One part per million of calcium was not sufficient for normal growth of either of the test plants, though good growth was obtained at calcium concentrations of from 5 to 200 parts per million, the optimum appearing to lie at about 100 parts per million.

*Availability of superphosphates*, R. P. Bartholomew.—Attempts to acidify phosphates with nitric acid in place of sulfuric acid "have produced a somewhat hygroscopic compound containing 11.6 per cent available phosphoric acid and 9.3 per cent nitrogen as nitrate. The amount of dry matter produced by Sudan grass was 14.5 per cent greater in 1930 and 8.3 per cent greater in 1931 than that produced from an equivalent amount of monocalcium phosphate."

In ammoniated superphosphate tests, made in cooperation with H. W. Ross of the U. S. D. A. Bureau of Chemistry and Soils with Sudan grass as the test crop, "the phosphoric acid in ammoniated superphosphate containing 4.97 per cent ammonia and 19.54 per cent total phosphoric acid produced as favorable growth as an equivalent amount of phosphoric acid in monocalcium phosphate. The results also show that the phosphoric acid reverted during the ammoniation process has a relatively high availability."

*Availability of soil elements in rice soils*, L. C. Kapp.—Crowley silt loam samples were treated with 4–16–4 fertilizer at the rate of 500 lbs. to the acre, nitrogen being in the form either of sodium nitrate or of ammonium sulfate.

Rice was grown as a test plant. Calcium carbonate at the rate of 2 tons to the acre increased the grain yield from the sodium nitrate pots 59 per cent, that from the ammonium sulfate pots 50 per cent.

In a comparison of calcium oxide and carbonate, calcium magnesium carbonate, and magnesium carbonate, the highest yield from the liming tests was given by a magnesium carbonate application equivalent to 6 tons to the acre of calcium carbonate. In the same set of experiments a large application of potassium chloride was included. "The high potassium application had the same effect as the basic materials. This would indicate that the potassium and calcium ions may be antagonistic to a certain ion as well as changing the reaction of the soil solution to precipitate the ion at a time when it is most toxic to the rice plant.

"The soil solution was drained directly from a few jars of soil after the crop had been flooded for five weeks. It was found that the manganese content was high and the iron content was low. The manganese precipitated from the solution as the carbon dioxide gas was liberated. Thus it seems that the high manganese content of the soil solution under submerged conditions may directly or indirectly be the factor that determines the yield of rice on rice soil."

Phosphatic fertilizers were found to decrease the yield, an effect attributed to the reduction in iron content. In conjunction with large applications of calcium, however, the phosphate treatment permitted good yields, a result considered to indicate that phosphate is not a limiting factor in rice growing on typical rice soils.

"The analysis of rice straw shows that manganese is present in larger quantities than iron. From the data secured, it seems probable that the high content of manganese in the submerged soil solution is responsible for the low yield of rice. This element may be closely related to the three necessary elements for rice growth, namely, nitrogen, iron, and potassium."

**[Soil studies of the Delaware Station]** (*Delaware Sta. Bul. 172 (1931), pp. 21, 50, 51*).—Several studies are noted.

[*Buffer studies*], H. C. Harris.—It was shown that although some properties of the soil are altered when the soil is air-dried, the buffer capacity remains unchanged by this treatment.

*Factors that influence nitrogen fixation in soils*, T. F. Manns.—After a period of four years from the time of treatment with certain chemicals there was made a quantitative and qualitative survey of the flora to learn the influence of the several carbonates (Ca, Mg, Na, K), sulfates (Ca, Mg, Na, K, Cu, Mn), and phosphates on the physiological groups identifiable on media, such as the ammonifiers and the nitrogen-fixing organisms (Azotofiers), including the nodule organism of legumes.

"For the Azotofiers, we have used Ashby's mannite agar with some success. We have noted also the *Bacillus fluorescens* group, the Actinomycetes, and the molds. Some remarkable changes in the flora have resulted from the influence of these treatments during the four years. The ammonifying group, including the *B. fluorescens* group, have remained remarkably permanent during the four-year period. However, certain treatments, particularly sodium carbonate (2,000 lbs. per acre), have completely destroyed the Actinomycetes. On the other hand, the Azotofiers, including *B. radicicola* of the legumes have been quite constant in number despite the alkaline and acid treatments."

*The influence of the pH on the soil flora*, T. F. Manns.—Effects of soil treatment with hydrated lime and with sulfur upon the numbers of various organisms were determined. At pH values below 4.0 nitrogen fixing organisms were completely destroyed. "However, such applications of sulfur (several tons per acre on the surface) as to bring about a pH of 3.5 or 4 in the surface 3 in. did not influence the Azoto group at a depth of 18 in. On the other hand, applications of lime (12 tons or more) on the surface greatly increased the nodule group on alfalfa to a depth of 18 in., there being 18 millions per gram of soil at this depth, which was over ten times the number found at 3½ in. and 7 in., respectively."

**Report on soil experiment fields,** G. Roberts and J. F. Freeman (*Kentucky Sta. Bul. 322 (1931), pp. 353–417*).—Following an introduction which describes the general plan of the experiment fields, the method of computing crop increases, fertilizer materials, and method of reporting crop yields, and the manner of stating crop and fertilizer values, the present bulletin gives in detail the results of a large number and variety of fertilizer and liming trials made on the Berea, Greenville, Mayfield, and Lone Oak fields operated since 1913, and the Fariston and Campbellsville fields upon which the tests were begun in 1916 and 1919, respectively. Recommendations more generally applicable throughout the State conclude the bulletin. A similar report on earlier work has already been noted (E. S. R., 56, p. 812).

**Management of cane soils,** J. O. Carrero (*Porto Rico Sta. Rpt. 1930, pp. 10–13*).—Experiments were made upon soil alone, soil with trash as mulch, trash mixed with soil, trash placed 1, 2, and 3 in., respectively, below the surface in a horizontal layer, and trash placed in an inclined layer reaching from bottom to top of the vessel containing the soil. The lime was (1) left on top of the soil, (2) mixed thoroughly with the soil, and (3) spread on the surface of the trash layer. Sufficient water was added to maintain the optimum moisture content of the soil. The first analyses were made 15 days after the experiment was started, and thereafter every tenth day. The glass containers used were weighed weekly and were made up to weight by the addition of rain water.

"There was a drop in the nitrate content of soils receiving trash as mulch, whether limed or not, as compared with the soils receiving no treatment, the loss increasing up to the fifth analysis. Soils to which trash had been added in horizontal layers contained nitrates, but the drop in content was greater than that shown by the mulched samples. The losses in the soils receiving trash in vertical or inclined layers were smaller than when the trash was applied in horizontal layers, and the loss tended to increase up to the fifth analysis."

Difficulty was encountered in the determination of the nitrate content of the extracts of these soils by reason of the dark color of the extracts themselves (the phenoldisulfonic acid method being used). Clarification with hydrated copper oxide precipitated in situ left a small quantity of the soluble organic matter in solution. This could be destroyed by hydrogen peroxide, it was shown, but the use of the last-named reagent, in the case of the larger quantities at least, tended to lower the nitrate content as determinable by the phenoldisulfonic acid reagent.

**[Soil and fertilizer studies in Virginia, 1928–1931]** (*Virginia Sta. Rpt. 1928–1931, pp. 21–24, 26, 27, 53–55, 81*).—Earlier work (E. S. R., 61, p. 716) is continued.

*Green manuring project.*—Report is made of field plat trials of green and of mature rye as a source of soil organic matter. The lysimeter method for measuring losses of plant nutrients was added in 1929. There was a greater outgo of water from the lysimeters in which the soil had received organic matter, particularly during periods of moderate rainfall. The lysimeters which received the mulch of organic matter showed a greater quantity of initial nitrate nitrogen, but at the end of the first year the quantities of nitrate nitrogen were found practically the same. Green rye was readily nitrified. Mature rye, when incorporated as the mulching material, depressed nitrification and the depression was intensified when this material was turned under, but in spite of this fact the nitrate nitrogen recovered in the drainage was always slightly greater than that from the control. The moisture relationships in this study showed that mulching increased the water holding capacity of the soil. A relatively large quantity of calcium carbonate, magnesium carbonate, and total bases was contained in the leachings from the lysimeters treated with organic matter as compared with that from the control lysimeters. The application of green rye gave very high increases in calcium and magnesium leachings as compared to mature rye. The organic matter treatments produced no marked changes in the liberation of potassium and sulfur.

The loss of nitrate nitrogen from the lysimeters in which the organic matter was worked into the soil was slightly greater, the increase over control lysimeters being about 161 lbs. per acre for the green material, and around 40 lbs. per acre for the mature rye.

*Lysimeter investigations.*—Lysimeter equipment described in a previous report (E. S. R., 61, p. 713) was used in experiments confined mainly to lime problems and the effects of applications of lime upon plant food already contained in the soil.

"The several kinds of lime from different sources appear to be equally available, but there is a slightly increased neutralizing effect from dolomitic limestone. Calcium carbonate in several forms and burnt lime depress the native magnesium content of the soil as measured in the leachings. The opposite effect was noted where dolomitic limestone was applied. . . . The addition of organic matter to the soils increased the outgo of calcium and magnesium during the first three years of the investigation, probably due to the fact that a greater volume of water passed through the rims. At the present time all treatments are giving practically the same amount of percolate for a given depth of soil."

*Phosphate and sulfur experiment.*—No benefit from sulfur applied as calcium sulfate equivalent to that contained in superphosphate could be shown in trials of raw rock phosphate, basic slag, and bone meal as sources of phosphorus.

As a source of nitrogen, manure gave the best results, sodium nitrate leading the commercial sources of this element. The differences were in all cases only slight.

*Fertilizer application.*—The results of this experiment indicated little difference between small annual applications and larger, less frequent applications.

*Superphosphate experiment.*—The 16 per cent superphosphate requirement of a Hagerstown silt loam for the production of certain crops was tested with inconclusive results.

*Lime experiments.*—Comparable results were secured from burnt lime and ground limestone when these were used in equivalent quantities, and the evidence appeared to favor the application of smaller quantities of lime than those formerly recommended. Trials of ground limestone, burnt lime, marl, and precipitated marl for a period of 15 years are tabulated.

*Rates of applying lime.*—Liming for various crops with from 600 to 4,800 lbs. to the acre showed that light applications of lime were as satisfactory as heavy applications, and that there was no advantage in applying more than 1,800 lbs. of lime per acre to the crops studied.

*Fertilizer experiments*.—In the course of seven years' trials at the Augusta County Substation it appeared that "as a general rule fertilizers and lime together produced the most satisfactory results. In these tests applications of phosphate have paid highest returns for each dollar invested. However, potash pays for its use in yield and improved quality. Nitrogen pays well on plats which do not grow legumes, but may be maintained in sufficient quantities by the proper use of legumes in the rotations."

**Effect of paper mulches on soil temperature, soil moisture, and yields of certain crops**, A. SMITH (*Hilgardia* [*California Sta.*], *6* (*1931*), *No. 6, pp. 159–201, figs. 30*).—Covering experiments extending over a period of four years and carried out on a brown loam soil at Davis, Calif., the present paper reports the observations that during the dry season and in unirrigated soils, nonperforated black paper was more effective in conserving moisture than was either perforated black paper or gray paper. The effect was found to be confined to the surface 4 in. of the soil, however; and it was ascribed to the condensation of water underneath the paper. Black papers were found to raise, gray papers to reduce, the soil temperature. Black paper perforated to the full width of the plat gave soil temperatures the same as those of plats without paper mulch, and where gray paper similarly perforated was applied, soil temperatures were lower than in the unmulched plats.

Less weeding was needed where the plats were fully covered with nonperforated paper. Also, the paper mulches gave some increase in the yields of grain sorghum and of potatoes, grown one season and two seasons, respectively, as indicator crops. Potatoes produced at the higher temperatures induced by black paper mulches "were more elongated and pear-shaped than those produced at lower temperatures."

In practice, however, "the use of paper mulch except on small areas does not seem feasible at the present time because of the initial cost of the paper and its application, and the extra time necessary in planting and caring for the crop (spraying, etc.) in order to avoid undue injury to the paper."

**The use of ammonia and nitrate nitrogen by certain crop plants**, V. A. TIEDJENS and W. R. ROBBINS (*New Jersey Stas. Bul. 526* (*1931*), *pp. 46, figs. 8*).—Tomatoes, soybeans, peach seedlings, and other plants were grown in nitrogen-free white quartz sand which had been washed practically free from colloidal material, and a nutrient solution of controlled pH value was supplied.

It was found that under the experimental conditions specified, the H-ion concentration of the nutrient solution, directly or indirectly, is a controlling factor in the assimilation of ammonia nitrogen; that ammonia nitrogen was not toxic to crop plants; that plants produced a good commercial crop and used efficiently comparatively high concentrations of ammonia in the form of ammonium hydroxide or sulfate of ammonia without injury; that ammonia nitrogen, directly or indirectly, had a beneficial effect on metabolism of iron by crop plants; that the H-ion concentration of the nutrient medium had a greater influence on ammonia and nitrate assimilation in the plant than did the combination of salts employed; that if pH and other conditions were optimum for ammonia and nitrate assimilation in respective nutrient solutions, ammonia was more rapidly assimilated than nitrate at a given temperature; and that under many soil conditions ammonia compounds produced more luxuriant growth of crop plants than nitrate compounds.

**Nitrogen content of rainwater**, H. H. FINNELL and H. W. HOUGHTON ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 34* (*1932*), *pp. 3–8*).—Continuing similar data on the nitrogen content of the 1930 rainfall (E. S. R., 64, p. 521), in a total 1931 rainfall of 15.45 in. at Goodwell, Okla., there was found 1.42 lbs. of nitrogen per acre. Of this total nitrogen, 23.32 per cent is reported as having taken the form of nitrates, 6.85 per cent that of nitrites, and 69.82 per cent that of ammonia.

"Nitrites were more than 10 times as plentiful during the cooler season of the year than during the warmer." Lightning occurring previous to the rain or accompanying it appeared to have an important effect upon the nitrogen content of the rainfall. The content of ammonia nitrogen appeared related to the dust content of the air.

**Commercial fertilizers report for 1931,** E. M. Bailey (*Connecticut State Sta. Bul. 331 (1931), pp. 69+XI*).—This bulletin is confined almost exclusively to the usual tabulations of analytical data. It contains, however, a brief history of fertilizer control in Connecticut and an account of an agreement on labeling requirements reached in 1931 by fertilizer control officials of the New England and Middle Atlantic States, Virginia, and West Virginia.

**Commercial fertilizers, 1931,** J. M. Bartlett (*Maine Sta. Off. Insp. 141 (1931), pp. 49–80*).—With the fertilizer analyses for the current year are given brief descriptions of the compounds now used as sources of nitrogen, phosphoric acid, and potash.

**Inspection and analysis of commercial fertilizers, spring, 1931,** L. D. Haigh (*Missouri Sta. Bul. 306 (1931), pp. 12*).—This bulletin consists of the usual fertilizer analyses.

## AGRICULTURAL BOTANY

**Growth and tropic movements of plants,** J. C. Bose (*London and New York: Longmans, Green & Co., 1929, pp. XXIX+447, figs. 229*).—This is a many-sided account of the various responses of which plants are claimed to be capable.

**The motor mechanism of plants,** J. C. Bose (*London and New York: Longmans, Green & Co., 1928, pp. XXV + 429, figs. 242.*)—This volume of the series on plant physiology (E. S. R., 52, p. 819; 57, p. 118) deals chiefly with the motor mechanism of the plant as compared and contrasted with that of the animal.

**Stomatal apparatus in fruits and the aeration of hollow fruits** [trans. title], M. Fischer (*Bot. Centbl., Beihefte, 45 (1929), 1. Abt., No. 3, pp. 271–389, pls. 3, figs. 3*).—A study is described in considerable detail as made from the anatomical, developmental, physiological-ecological, and systematic standpoints, by the use of different methods, of a series of fruit stomata in relation to fruit types in the Papaveraceae (*Papaver* sp. and *Chelidonium* sp.) and Solanaceae (particularly *Lycium vulgare, Solanum tuberosum, Atropa belladonna, Capsicum annuum longum, Hyoscyamus niger, Datura stramonium,* and *Nicotiana rustica*).

**Materials for a study of the assimilatory system in plants** [trans. title], L. Montemartini (*Ann. Bot.* [*Rome*], *18 (1928), No. 1, pp. 38–91*).—Furnishing a selected bibliography of 249 titles, the author indicates the scope of the researches suggested and appropriate methods, with details, largely tabular, from studies of a number of plant forms.

**The water relation to cotton plant in Manchuria.—I, Transpiration and water requirement** [trans. title], S. Terada and K. Yoshitake (*Research Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 3 (1931), pp. [1]+56, pls. 3; Eng. abs., pp. 54–56*).—Experimental data are given and summarized for tests made of the relation between transpiration and a few climatic elements, and the measurement of water requirement of two indigenous cottons (a naked and a fuzzy seeded variety) and the upland Turkestan 1306.

**Sensitivity of plants to lime in the presence of humus and in the absence of clay** [trans. title], A. PETIT (*Rev. Hort.* [*Paris*]. *101* (*1929*), *No. 18*, *pp. 457*, *458*).—Observations and tests are presented to show the necessity for the adaptation of soil compositions and conditions to a given plant, and particularly the proportions of constituents.

**The visible and ultraviolet absorption spectra of carotin and xanthophyll and the changes accompanying oxidation**, H. J. MCNICHOLAS ([*U. S.*] *Bur. Standards Jour. Research*, *7* (*1931*), *No. 1*, *pp. 171–193*, *figs. 5*; *abs. in U. S. Dept. Com.*, *Bur. Standards Tech. News Bul. 171* (*1931*), *pp. 77*, *78*).—The absorption spectra of equal molecular concentrations of pure carotene and of xanthophyll in alcohol-ether solution have been studied throughout the visible and the ultra-violet spectral range, and the changes in the absorption spectra have been followed as the pigments oxidized slowly in solution.

The absorption spectra of the pure unoxidized pigments have essentially the same structure, consisting each of three groups of overlapping and partially resolved component bands. The bands for xanthophyll are sharper and closer together than are the corresponding bands for carotene. The strongest group of bands for each pigment is in the blue-violet. The frequencies $\left(\text{frequency}=\frac{3\times10^{5}}{\text{wave length in millimicrons}}\right)$ of these strong band groups are for xanthophyll 602, 636, 672, 708 and 746, and for carotene 589, 625, 666, 712, and 764. The ultra-violet band groups are weak as compared with the visible group, and the composition is not so definite. The groups are centered at frequencies of 903 and 1,119, respectively, for xanthophyll, and at 882 and 1,098, respectively, for carotene. The three groups of component bands for each pigment form a regular sequence of bands, the frequencies of which are represented by the parabolic equation "$\nu-\nu_0=a\ (n-n_0)^2$ wherein $\nu_0$, $n_0$, and $a$ are constants, and $n$ takes successive integral values. A periodic variation of intensity in the above progression of component bands gives rise to the appearance of the definite band groups and to the characteristic form of the absorption curves."

"During slow oxidation in solution the spectrum of each pigment is observed to pass through the same series of changes. . . . The carotene spectrum does not become identical with that of pure xanthophyll during the process, so that carotene is not oxidized to xanthophyll."

Oxidation proceeds in two definite stages which are the same for both pigments. These are outlined.

The oxidation experiments also lend support to the contentions of Schertz (E. S. R., 65, p. 216) that the series of yellow xanthophylls (said to have been described by Tswett as different pigments) represent only different stages in the oxidation of a single pigment. Tswett's description is said to be based principally on the positions of absorption bands in the visible spectrum. These positions are said to correspond to successive changes in the absorption spectrum of xanthophyll during slow oxidation in solution.

As to the present status of studies on the molecular structure of carotene and xanthophyll, "carotene is conceived as an acyclic chain of four isoprene residues with two identical, or very similar, carbocyclic ring structures, one at each end of the chain." Complete agreement on all details has not, however, been reached. Xanthophyll also has not been definitely determined structurally. "In view of the similarity in physical and chemical properties of these pigments, there can be little doubt that their molecules are constructed on essentially the same atomic pattern."

**The apparent influence of inulin on the meristem in roots of Compositae,** T. Holm (*Bot. Centbl., Beihefte, 47 (1931), 1. Abt., No. 3, pp. 359–377, figs. 17*).—Among Compositae dealt with in this paper, inulin has been observed in the form of sphaerocrystals in the roots of *Hieracium venosum, H. gronovii, H. scabrum, H. paniculatum, Vernonia noveboracensis, Aster divaricatus, A. linariifolius, Helenium autumnale,* and *Prenanthes alba,* all North American plants. As to the aerial organs, inulin was observed only in the basal leaves of *Hieracium venosum* and in the stem beneath the inflorescence in *H. scabrum.* It is shown by detailed statements that inulin may be present in some parts or tissues and at the same time absent in others of the same plant. Inulin was never found in the epidermis, exodermis, cork, phelloderm, sclerenchyma, or leptome; seldom found in the endodermis or in ducts having epithelium; and occasionally found in the pith and in the libriform when very young. Inulin is most abundant in the meristem, close to the primary hadrome, and is present somewhat plentifully in the cortical parenchyma.

The presence of the inulin appears to stimulate the meristem to divide, at the same time arresting its development into secondary mestome. In tissues fully developed, as cortex, no modification was observed. The effect on the meristem is conspicuous, as particularized.

The fact that certain tissues are impermeable to inulin may supposedly be due to some particular chemical composition in the cell wall. Certain genera are adapted to accumulate much inulin, and this is the case notably in the stele. Great structural differences are displayed by the inulin-bearing roots.

"We can not abstain from expressing our opinion about the presence of inulin in the roots of the Compositae examined, that it may depend on 'invasion' rather than deposition."

**Toxic action of aqueous sodium chlorate on Nitella,** H. R. Offord and R. P. d'Urbal (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 9, pp. 791–810, figs. 3*).—Studies in the U. S. Department of Agriculture showed no accumulation of the chlorate ion within the cytoplast when sodium chlorate acts injuriously on Nitella. Penetration into the cytoplast of Nitella even after considerable injury had taken place was found to occur very slowly, and even more slowly when the light intensity was reduced. Injury of Nitella cells by sodium chlorate was manifested in (1) an outward diffusion of chloride from the vacuolar sap, (2) loss of turgidity, and (3) appearance of opalescence in the immersion solution.

Ammonium chloride, as measured by an increase of total nitrogen in the expressed sap, accumulated rapidly, and the addition of ammonium chloride to sodium chlorate resulted in a medium as toxic as or even more toxic than the simple sodium chlorate. On the other hand, mixtures of sodium chlorate and calcium chlorate were less toxic than sodium chlorate alone, the calcium chlorate apparently exerting its well-known protective action when combined with the sodium chlorate.

Sodium chlorate proved to be more toxic in acid than in neutral or alkaline media. The fundamental toxicity of sodium chlorate is attributed to the chlorate ion. When equimolal solutions of sodium chlorate and sodium nitrate that were not immediately plasmolytic were used, the chlorate solution was found to be many times more toxic than the sodium nitrate.

**The multiple mycorrhizas of trees,** M. C. Rayner (*Forestry, 3 (1929), No. 1, pp. 26–32*).—It is thought that the control of mycorrhiza formation may become a matter of urgent importance in regard to the cultivation of certain crop plants. The main purpose and effect of the present article is to summarize the results obtained by appropriate modern experimental methods. "The immediate need is for more work on similar lines directed to learn the best means of promoting favorable humus conditions and encouraging those fungi most effective in establishing beneficial symbiosis, work clearly involving the close cooperation of the forester with the trained laboratory worker."

**A diagrammatic summary of various bacterial classifications,** R. E. Buchanan, R. S. Breed, and L. F. Rettger (*Jour. Bact., 16 (1928), No. 6, pp. 387–396*).—Confusion having been caused by the publication during recent years of many classifications of bacteria, a clarification of the situation is attempted by listing in comparative outline several important classifications. No preference is implied for any classification.

## GENETICS

**The genetical theory of natural selection,** S. Wright (*Jour. Heredity, 21 (1930), No. 8, pp. 349–356*).—A discussion of the points of similarity and differences between the theories of natural selection advanced by Fisher (E. S. R., 64, p. 330) and by Wright (E. S. R., 65, p. 324).

**Primary and secondary chromosome balance in Pyrus,** C. D. Darlington and A. A. Moffett (*Jour. Genetics, 22 (1930), No. 2, pp. 129–151, pl. 1, figs. 41*).—Studies at the John Innes Horticultural Institution of the root tip cells and pollen mother cells of varieties of *P. malus*, *P. floribunda*, and *P. ringo* gave evidence that the basic chromosome number in Pyrus is 17. Cultivated varieties were all orthoploid. Multiple association was noted among chromosomes of diploid Pyrus, giving in extreme cases seven groups—four quadrivalent and three sexivalent. Associations of 4, 5, 6, 7, 8, and 9 chromosomes were recorded in triploids of *P. malus*, although trivalents were the rule. The 34 chromosomes in the diploid Pyrus were found of seven types. The number 17 is considered a secondary basic number and the derived series of polyploids secondary polyploids. The authors believe that the Pyrus group possibly owes its special morphological characters to this reorganization of the nucleus.

**Fertility and vigour of apples in relation to chromosome number,** M. B. Crane and W. J. C. Lawrence (*Jour. Genetics, 22 (1930), No. 2, pp. 153–163*).—That incompatibility is rarely completely expressed in apples was shown in the fact that of 243 cross-pollinations made at the John Innes Horticultural Institution only 5 crosses entirely failed to yield fruits. Obviously in the apple only a very low proportion of fruit to flowers is essential to a crop, and although each fruit possesses 10 embryos the imperfect development of only one often insures a fruit. Fruiting thus approaches parthenocarpy, and fruitfulness may be maintained despite a high degree of generational sterility. Triploidy in apples is not necessarily a handicap because such forms are often productive (Bramley Seedling), and propagation is altogether asexual. The sexual offspring of triploids whether derived by selfing or by crossing with diploids lacked vigor, presumably as a result of their aneuploid constitution. Triploid apples have little value in practical breeding, making advisable the cytological examination of varieties.

**[Hybrid vigor in cotton],** J. O. Ware (*Arkansas Sta. Bul. 268 (1931), pp. 30, 31*).—Hybrid vigor occurred in the $F_1$ of the species crosses Winesap × Pima (Egyptian), Winesap × sea island, and Sproull × Pima, but was not expressed by all of the plant characters. Variation in the degree of expression is discussed briefly.

**Species hybrids in plants,** O. Renner (*Handbuch der Vererbungswissenschaft. Band II, Artbastarde bei Pflanzen. Berlin: Borntraeger Bros., 1929, vol. 2–A, pp. IV+161, figs. 83*).—The present exposition, which deals in systematically analytical detail with plant species hybrids, presents also a bibliography of about 568 titles.

**Lethal factors and live stock breeding,** [F. F. Darling] (*Imp. Bur. Anim. Genet.* [*Edinb. Univ.*], *Quart. Bul.*, *2* (*1931*), *No. 3, pp. 49–61*).—A review of the occurrence of lethal factors in the various classes of animals, and their inheritance.

**Short spine, a new recessive lethal in cattle; with a comparison of the skeletal deformities in short-spine and in amputated calves,** O. L. Mohr and C. Wriedt (*Jour. Genetics, 22* (*1930*), *No. 2, pp. 279–297, pls. 3*).—The characteristics of short-spine calves which have occurred in the Oplandske mountain breed in Norway are described in considerable detail. This condition results from a shortening of the vertebral column due to aplasia or reduction in size with irregular fusion of adjacent vertebral rudiments during development. Such animals die during or just after birth. It appears that this condition is due to a single recessive gene. One heterozygous bull, in 55 matings to 27 of his own daughters, produced 11 short-spine calves.

A considerable discussion is presented of methods of testing bulls to determine those which carry this recessive gene, with suggestions of the numbers of daughter matings or the numbers of matings with heterozygous cows necessary to indicate that a bull is not a carrier.

**Colour inheritance in sheep, IV–VI** (*Jour. Genetics, 22* (*1930*), *No. 2, pp. 165–180, pls. 3; 181–190; 25* (*1931*), *No. 1, pp. 1–16, pls. 3*).—This series (E. S. R., 60, p. 324) is continued.

IV. *White colour, recessive black colour, recessive brown colour, badger-face pattern, and reversed badger-face pattern*, J. A. F. Roberts and R. G. White.—A wide variety of crosses were made during the period 1923–1929, involving white, badger-face, reversed badger-face, recessive black, and recessive brown. The results of these crosses indicated that white color is due to the presence of a dominant inhibitor for self-color. In the absence of the inhibitor the coat is either black or brown. There is also normally present a dominant inhibiting factor for the badger-face pattern. With the absence of the badger-face factor and the inhibitor, the reversed badger-face factor in either the homozygous or heterozygous form changes self-color into reversed badger-face. It is pointed out that the presence of the inhibitor in modern white-fleeced sheep permits them to carry many color factors which are not expressed.

V. *Dominant black*, J. A. F. Roberts and R. G. White.—From an analysis of the crosses previously reported in this series with Black Welsh Mountain sheep, the inheritance of dominant black is reported. It appears that more than one factor is responsible for this characteristic. When a dominant black factor is present the factors for badger-face and reversed badger-face pattern can not be expressed.

VI. *The genetic constitution of the wild Moufion*, J. A. F. Roberts.—A history is given of the Moufion sheep and descriptions are included of the coat color and pattern of several wild types. In the genetic studies of the composition of the Moufion breed, 28 $F_1$ and 38 $F_2$ and back-cross lambs were produced from matings of wild Moufion sheep with Black Welsh Mountain sheep, and 11 lambs from a cross between the $F_1$s and the brown Shetlands. From these results it appeared that the Moufions did not carry factors for the following characters: Dominant black, dominant brown, white, badger-face pattern, colored or spotted faces and legs in white-fleeced sheep, black-head pattern, white collar in colored sheep, and gray color at birth, but that it was a recessive black possessing the factors for reversed badger-face pattern.

**The character "hairless" in the mouse,** F. A. E. Crew and L. Mirskaia (*Jour. Genetics, 25* (*1931*), *No. 1, pp. 17–24, pl. 1*).—The results of a study of the inheritance of the character "hairless" in mice indicated that it behaved as a simple recessive. Matings of hairless × hairless produced 49 hairless offspring. Matings of heterozygous haired females with heterozygous haired males produced 158 haired and 76 hairless, and back-crosses of heterozygous haired females with hairless males produced 31 haired and 25 hairless offspring. In hairless animals the cutaneous structures are abnormal, the cutis thickened, the mammary glands rudimentary, and the nails grotesquely curved.

Studies of skin transplantation from haired to hairless animals indicated that there was no specific or general endocrine deficiency, but that the skin could not respond to hair growth promoting agencies.

**Breeding investigations on the inheritance of goiter in dogs** [trans. title], J. RICHTER (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 21 (1931), No. 3, pp. 483–503, figs. 16*).—A study of 84 offspring in the $F_1$ and $F_2$ generations of 2 male goiterous dogs indicated that this condition did not behave as a simple dominant or a simple recessive factor, although from the occurrence of the condition among the offspring it appeared to be hereditary.

**Studies in human inheritance.—IV, The "laws" of serologic race-classification,** L. H. SNYDER (*Human Biol., 2 (1930), No. 1, pp. 128–133, fig. 1*).—In continuing this series (E. S. R., 62, p. 514), the constancy of the blood groups in different races is pointed out, and the value of blood groups as additional criteria for race classification is indicated.

**Studies in human inheritance.—V, Multiple allelomorphism as opposed to linkage in blood group heredity,** L. H. SNYDER (*Amer. Nat., 65 (1931), No. 699, pp. 332–342*).—Continuing this series (see above), the author presents further analyses of blood group data in support of the triple-allelomorph hypothesis of blood group inheritance in man. The possibility of modification by nondisjunction is also mentioned.

**A statistical study of the relative goodness of fit of the two proposed theories of human blood group inheritance,** H. H. STRANDSKOV (*Jour. Immunol., 21 (1931), No. 4, pp. 261–277*).—The genetic theories for blood group inheritance, namely, the triple allelomorph theory and the two-factor hypothesis, were compared in 67 populations as to the goodness of fit according to the number of individuals of each group found and their theoretical proportions. It appeared that the theory of triple allelomorphs explained the inheritance of blood groups better than the two-factor hypothesis.

**Chemical embryology,** J. NEEDHAM (*New York: Macmillan Co.; Cambridge, Eng.: Univ. Press, 1931, vols. 1–3, pp. XXI+XVI+XVI+2021, pls. 15, figs. 537*).—An exhaustive account of the chemical and biological phenomena associated with embryonic development, including many tables and charts showing the chemical and physicochemical changes in the composition of embryos and their relationship to the vital functions. An extensive history of chemical embryology is also included.

**Development of the egg from the standpoint of the geneticist,** C. W. METZ (*Sci. Mo., 33 (1931), No. 2, pp. 117–134, figs. 29*).—An account is given of the behavior of the chromosomes in fertilization and in the growth and development of the fertilized egg and the formation of the mature animal or plant. Special attention is called to the function and part played by the genes in the development of the specific characters of the plant or animal concerned.

**Note on the ovary of female rat in parabiotic union with gonadectomized male or female,** K. TAKEWAKI (*Jour. Faculty Sci., Imp. Univ. Tokyo, Sect. IV, 2 (1931), No. 4, pp. 351, 352, pl. 1*).—Three stages of ovarian hypertrophy are noted in females united with gonadectomized males and females. There was an excessive formation of corpora lutea, which became atresic and finally developed into cysts. The time required for the cyst-formation to occur was influenced by the age and physiological conditions of the parabionts.

**Oestrous cycle of female rat in parabiotic union with male,** K. Takewaki (*Jour. Faculty Sci., Imp. Univ. Tokyo, Sect. IV, 2 (1931), No. 4, pp. 353–356, figs. 3*).—Four cases in which female and male rats were united parabiotically were used in following changes in the oestrous cycle. Oestrum recurred in females, although in some cases it was absent in the earlier stages of the union. The appearance of oestrum was verified by histological studies of the ovaries and the uterine tubes. The recurrence of oestrum was somewhat irregular.

**Influence of male or female gonadectomized parabiont on pregnant albino rat and its fetuses,** K. Takewaki (*Jour. Faculty Sci., Imp. Univ. Tokyo, Sect. IV, 2 (1931), No. 4, pp. 319–336, pl. 1*).—In these studies gonadectomized and entire male and female rats were united parabiotically with females at 7, 10, and 14 days of gestation. These results showed that at 7 and 10 days the gonadectomized male and female unions usually caused abortion or resorption, whereas in most cases pregnancy was normally terminated in parabiotic unions of pregnant females with males and females. When the time of uniting was delayed until the fourteenth day of pregnancy, parturition occurred at the end of the normal gestation period. Normal oestrum occurred following the termination of pregnancy.

**Ovarian and anterior pituitary hormones from the pregnant monkey,** E. Allen, W. P. Maddux, and J. W. Kennedy (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, pp. 403, 404*).—Smaller amounts of oestrin in the monkey placenta and smaller amounts of the horome of the anterior lobe of the hypophysis in the urine from pregnant monkeys were demonstrated than are ordinarily found to be present in the human.

**A rapid method for the diagnosis of early pregnancy from urine,** F. Eberson (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, pp. 407–409*).—A shortened procedure enabling diagnosis within 36 to 48 hours after injection is described for diagnosing pregnancy. Urine was used for this study and was freed from oestrin by precipitation with alcohol, suspension of the precipitate in physiological salt solution, and solution in ether. Immature female rats 18 to 21 days of age were used as test animals.

It is stated that the test in 175 consecutive cases was 100 per cent accurate, and it is suggested that this test may be used for differentiating pregnancy from conditions simulating it, including mortality of the fetus.

**On the relation of the duration of pregnancy to size of litter and other characters in bitches,** M. and K. Pearson (*Biometrika, 22 (1931), No. 3–4, pp. 309–323*).—An analysis is reported of the relation of the duration of pregnancy to size of litter, parity, and age of bitch in Pekinese, Pomeranian, and Pekinese-Pomeranian crosses bred in the Biometric Laboratory of the University of London. This analysis showed that increasing duration of pregnancy, increasing number of pregnancies, and increasing age tended to decrease the size of litter. It appears that the size of litter is the causal factor and hastens the end of gestation. The correlation between size of litter and gestation period was —0.4479. The possibilities of curvilinear relationships are suggested as reducing the size of the linear correlations in certain cases, especially the relation of age of bitch to number of pregnancies, which was +0.7967.

**"Castration cells" in anterior hypophysis of spayed rat following prolonged administration of estrin,** C. F. Fluhmann and G. V. Kulchar (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, pp. 417, 418*).—The results of these studies indicated that the characteristic cells ordinarily present in the anterior hypophysis of spayed rats could not be prevented from appearing in spayed animals by the subcutaneous injection of oestrin. Therefore, the absence of the oestrin stimulation in castrated animals is not the cause of the formation of the castration cells.

**Bovine quadruplets, including twins apparently monozygotic,** F. B. Hutt (*Jour. Heredity, 21 (1930), No. 8, pp. 339–348, figs. 3*).—There is reported a case of living bovine quardruplets consisting of one bull, one freemartin, and two heifers. The heifers appeared to be monozygotic twins and were also sterile. A few calves were produced by the bull.

**The mortality of a herd of mice under "normal" conditions,** M. Greenwood, W. W. C. Topley, and J. Wilson (*Jour. Hyg. [London], 31 (1931), No. 3. pp. 403–405*).—Based on observations on 329 mice from October 4, 1929, to May 27, 1930, the expectation of life has been calculated for mice of different ages housed in cages according to usual laboratory practice.

## FIELD CROPS

**The field experiment** [trans. title], T. Roemer (*Arb. Deut. Landw. Gesell., No. 302, 3 rev. and enl. ed. (1930). pp. 245, pl. 1, figs. 20*).—A revision and enlargement of the study noted previously (E. S. R., 55, p. 227) is presented, with a list of 313 titles.

**[Agronomic research in Arkansas],** M. Nelson, J. O. Ware, C. K. McClelland, G. Janssen, L. C. Kapp, J. R. Cooper, and V. M. Watts (*Arkansas Sta. Bul. 268 (1931). pp. 15–25, 26, 27, 28–30, 31–35, 52, 53, 56, 57*).—Experiments with field crops (E. S. R., 64, p. 430) reported on again included varietal trials with cotton, corn, wheat, winter and spring oats, rice (E. S. R., 65, p. 732), grain sorghum, sorgo for sirup, soybeans, cowpeas, and peanuts (E. S. R., 65, p. 633) ; fertilizer experiments with cotton along lines noted earlier, with corn, wheat, oats and clover in rotation, and with alfalfa, rice (E. S. R., 65, p. 732), potatoes, and sweetpotatoes; studies of tillering in oats as affected by transplanting and fertilizers (E. S. R., 65, pp. 825, 826) ; cultural (including planting) tests with cotton, corn, oats, rice (E. S. R., 65, p. 732), soybeans, and alfalfa; breeding work with cotton; pasture studies; studies on cotton fiber; and crop rotations variously fertilized and limed. Results obtained in 1930 in many of the experiments were reported as abnormal or inconsistent because of drought.

Cotton improvement studies brought forth Arkansas Rowden 40, a general purpose cotton, Arkansas Acala 37, an early strain for the northern portion of the Arkansas cotton-growing section, and Arkansas 17, a delta land cotton, which have met with much favor with cotton growers of Arkansas and other States. Station selections were also outstanding in variety trials. In 1930 all varieties at the Cotton Substation withstood the extreme drought much better on delta soil than on upland soil. Late varieties were stimulated in earliness to the point where they became the higher yielders, while the early cottons were so early that their yields were reduced. Nearly all the varieties when grown on delta land produced a longer staple than on upland, but in general the lint percentage was somewhat lower in the delta land tests. Current averages in selection of cotton for high and low oil and high and low protein in the seed have been noted earlier (E. S. R., 62, p. 828). In increasing quantities, sodium nitrate increased cotton yields, superphosphate had little or no effect after a moderate application was reached, and potassium chloride was inconsistent in effects. None seemed to affect size of boll or seed, length, percentage, or index of lint, or lint per boll. The rates of fruiting under the several treatments is shown.

Growing vetch, crimson clover, Austrian field peas, and other legumes on rice land resulted in small increases in the yield of rice, with an apparent advantage from plowing the legumes under early. Indications were that rice can develop to maturity when grown on a nutrient solution containing either the nitrate or the ammonia form of nitrogen. More nitrogen was taken up when plants were fed on ammonium sulfate than on calcium nitrate, but plants on the latter made the greater root development.

When legumes were planted with corn, the losses in corn yields were with cowpeas 23.1 to 25.7 per cent, soybeans 20.8 to 29.5, velvetbeans 16.1 to 27.5, and with mung beans 17.2 to 19.9 per cent, the losses being greater with the heavier seeding rates of the legumes. With wider corn rows and fewer corn plants per acre and the legumes planted in the wide middles, the loss in corn yields was from 7 to 22.2 per cent, largely thought due to reduction in stand rather than to the legumes. Gains in the cotton crop upon plats where a considerable decrease occurred in the corn yields were held due to the increase of nitrogen and possibly of moisture. The percentage of gain in seed cotton after soybeans planted with corn was almost the same as the percentage loss in corn as the result of such planting.

Studies of the effect of different practices on alfalfa stands showed that for good stands a complete fertilizer including a small percentage of nitrogen may be desirable before seeding alfalfa, and that phosphorus tends to stimulate early spring growth more than nitrogen or potassium.

With oats grown in flats the largest percentage of winterkilling took place in soils heavily fertilized with nitrogen or potassium and the least killing on soils treated with phosphorus. The freezing of flats containing plants in artificial freezing chambers is indicated as a method for determining winter hardy strains of oats and the relative value of fertilizers for increasing or decreasing winter hardiness.

Bermuda grass was the only grass found satisfactory as a base for permanent pasture, and no others were even effective supplements. Lespedeza and hop clover were the most promising legume pasture supplements.

**[Agronomic research in Delaware]**, G. L. SCHUSTER, C. E. PHILLIPS, and H. C. HARRIS (*Delaware Sta. Bul. 172 (1931), pp. 10–20*).—Investigations with field crops (E. S. R., 64, p. 622) included variety trials with alfalfa and soybeans; fertilizer tests with wheat, corn, alfalfa, and sweetpotatoes; storage trials with sweetpotatoes; crop sequence studies; and attempts to find the optimum soil reaction for growth of alfalfa, timothy and clover, bluegrass, wheat, soybeans, and crimson clover.

Fertilizer applied for corn in various positions as to the seed gave most satisfactory results with 125 to 250 lbs. in parallel bands slightly above the seed. A localized application not in contact with the seed seemed much better than broadcasting or hill applications in contact with the seed.

Wheat varieties following soybeans yielded practically the same as after corn. Replacing Wilson soybeans with a newer variety did not appear advisable unless a market demand exists for the seed.

Sweetpotatoes on Sassafras sandy loam, deep phase, receiving fertilizer containing different sources and percentages of potassium, made best yields and a high percentage of primes and stand with a 3–8–10 mixture having potassium chloride as the potash carrier. After storage from harvest until the last week in January the average percentage of marketable roots from check plats was 67.4, potassium sulfate plats 72.5, kainite 55.6, and manure salts 53.5.

**[Agronomic investigations in Virginia, 1927–1931]** (*Virginia Sta. Rpt. 1928–1931, pp. 7, 25, 26, 27, 28, 49–53, 55, 74–80, 81, 82*).—Field crops experiments (E. S. R., 61, pp. 726, 730) reported on from the station and county substations, some of which have been noted earlier, included breeding work with corn, wheat, oats, potatoes, soybeans, peanuts, and orchard grass; variety trials with corn, wheat, oats, rye, potatoes, tobacco, soybeans, alfalfa, lespedeza, red clover, pasture plants, and cover crops; fertilizer trials with tobacco, alfalfa, cotton, and pasture; a study of the factors influencing growth and maturity of corn (E. S. R., 66, p. 19); liming tests with peanuts and other crops; planting tests with sweetclover; a harvesting test with tobacco; production trials with seed potatoes (E. S. R., 60, p. 331), seed hemp, and fiber flax; and crop rotations.

Nitrogen applied to pastures in large quantities, provided the other fertilizer needs were met, increased the protein content of grasses, the carrying capacity for cattle, and the grazing season, but decreased the quantity of white clover present. Young, tender grasses were very high in protein, and where heavy applications of nitrogen were made dry matter yields were very high early in the season. During summer the yield and percentage of protein diminished but increased again in the fall. Dried clippings compared favorably with cottonseed and peanut meals as a protein concentrate.

Alfalfa fertilizer tests at the James City County Station indicated as the minimum needs of the crop in the section nitrogen 40 lbs., potash 40, and phosphoric acid 120 lbs. per acre, which represents 1,000 lbs. of 4–12–4 fertilizer. Application of 10 tons of manure and 500 lbs. of 16 per cent superphosphate per acre usually insured good stands and excellent production. A liming test showed optimum results obtained with alfalfa, red clover, and sweetclover where 1 ton of ground limestone was applied per acre every third year, and with corn, soybeans, wheat, and oats receiving 1,200 to 1,800 lbs. every third year, whereas rye did not respond to liming and potato yields were reduced where more than 1,000 lbs. of limestone per acre was applied.

Crop nutrition and crop relations experiments at the Caroline County Station in cooperation with the U. S. Department of Agriculture showed that small grains and grasses do better after potatoes or tobacco than after corn or other small grains fertilized similarly; that tobacco yields may be maintained over at least 12 years as well under continuous cropping as in rotations, if liberal quantities of fertilizer are applied; and that vetch, cowpeas, soybeans, and crimson clover when well inoculated can supply all the nitrogen needs of tobacco and corn which follow them in rotation.

The best fertilizer combination for dark tobacco on typical dark tobacco soils was determined by the Appomattox County Station to comprise from 80 to 100 lbs. per acre each of ammonia, phosphoric acid, and of potash per acre. High grade complete fertilizers in relatively heavy applications were more profitable than in smaller quantities. Dried blood was found superior to sodium nitrate or ammonium sulfate for dark tobacco. It appeared desirable to furnish the nitrogen from both organic and inorganic carriers. There was little difference whether potassium sulfate or chloride supplied the potassium. Satisfactory tobacco rotations included corn or tobacco, wheat, and mixed grasses 2 years, and tobacco, crimson clover and rye, soybeans for hay, wheat, and clover.

**[Field crops work in Porto Rico in 1930]**, T. B. McClelland, R. L. Davis, and D. W. May (*Porto Rico Sta. Rpt. 1930, pp. 16, 17, 18, 19, 21–34, 40–49, figs. 19*).—Investigations again (E. S. R., 64, p. 335) reported on comprised breeding work, trials of seedlings, hybrids, and introduced varieties, and refractometer tests, all with sugarcane; breeding work with corn; and trials of dasheens, taros, and yautias, and of varieties of sweetpotatoes and of legume cover crops. Noteworthy sugarcanes included P. O. J. 2878, a mosaic-free variety widely adopted on the island, Mayaguez seedlings Nos. 3, 7, and 42, regarded as commercially immune to mosaic, and No. 28 desirable for its prolific stooling habit. New technic employed included the bag withdrawal method of pollinating corn and a simple method of sampling the juice of sugarcanes for the hand refractometer.

Forage crops for Porto Rico described by May from extensive experience and experiments included as outstanding grama, Para, and Guinea grasses for grazing; Guatemala and Natal grasses and Uba cane for cutting; velvetbeans, cowpeas, and soybeans of the legume forages; and corn for silage.

**[Crops experiments in West Virginia, 1928–1930]** (*West Virginia Sta. Bul. 244 (1931), pp. 25, 27–29, 30*).—Good wheat yields were obtained by D. R. Dodd and R. J. Garber on areas from which soybeans were harvested August 10 and 30 but not from a plat harvested September 25, 3 days before planting the wheat. The nitrate content of the soils was found lowest at soybean harvest, but it increased rapidly following harvest and within a month was ample for vigorous wheat growth. Early harvest of soybeans or application of nitrogen fertilizer appeared essential to good yields of wheat as a following crop. With corn, however, late harvest of soybeans was preferable, since it provides a high nitrate content during late spring and summer when the needs of corn are the greatest. See also a previous note by Deatrick (E. S. R., 60, p. 333).

Rye and vetch proved more satisfactory as winter cover crops in tests by Garber, T. E. Odland, and H. O. Henderson than sweetclover and crimson clover, which were almost complete failures due to winterkilling. Appreciable yield increases of corn as silage followed the rye and vetch cover crop, but the yields of soybean hay were increased only slightly.

Preliminary indications in studies by W. H. Pierre and R. J. Friant were that the optimum soil reaction for the growth of alfalfa varies with soil type and that alfalfa will grow well at pH values considerably below neutrality. All soils but one responded to phosphorus fertilization, the response varying in degree with the soil type. In mowing tests the stand was reduced where more than three crops were taken in a season. At Lakin soil acidity studies by T. C. McIlvaine and Pierre showed that cowpeas were much more tolerant of soil acidity, as determined by pH values, than were soybeans. Cowpeas grew almost as well in the most acid soil, pH 4.01, as in the less acid soils, while the yield of soybeans was reduced greatly at pH 4.04.

Grimm, Canadian variegated, and common alfalfas from Kansas, Nebraska, Utah, and Northwestern States surpassed those from elsewhere in the United States or foreign countries. Alfalfa, tall oatgrass, and timothy grown in pure cultures each averaged more than 2 tons per acre, while Italian and perennial ryegrasses, meadow fescue, and bromegrass were not very satisfactory. Meadow mixtures containing tall oatgrass gave the highest yields; timothy and alfalfa also were very satisfactory in increasing yields in several mixtures including them. Breeding work with sweetclover by Garber, M. M. Hoover, and R. B. Dustman is noted briefly.

Liming produced increased yields of all crops at Lakin except potatoes in experiments by McIlvaine and Garber. The higher yields usually were obtained from the crop rotations in a livestock farming system where roughages are fed or used for bedding and the manure returned to the soil as compared with a grain system where the grains and first hay cutting are removed and the crop residues and aftermath returned to the soil. Wheat on cowpea stubble turned under somewhat outyielded wheat on soybean stubble. Two-year rotations tended to produce somewhat lower yields than 3- and 4-year rotations.

**Buckwheat milling and its by-products,** M. R. Coe (*U. S. Dept. Agr. Circ. 190 (1931), pp. 12, figs. 3*).—The varieties and uses of buckwheat and methods of milling for flour and for groats are described briefly, and analyses of the grain and its various milling products are tabulated.

Most of the 11,000,000 to 15,000,000 bu. of buckwheat produced annually in the United States is used mainly for griddle cakes, either as straight flour or compound with flours of other grains. A rather small quantity is milled into groats, which furnish roasted broken kernels and farina to be used in soups, as porridge, and as breakfast foods. Of the by-products, middlings have the greatest feed value, giving satisfactory results when fed with other suitable proteins to dairy cattle and swine.

**Variations in stand as sources of experimental error in yield tests with corn,** H. E. Brewbaker and F. R. Immer (*Jour. Amer. Soc. Agron., 23 (1931), No. 6, pp. 469–480*).—Selfed lines and single and double crosses of corn were grown during 1928 and 1929 at the Minnesota Experiment Station and at Waseca, Minn., at spacings varied systematically. For inbred lines at the station the yield of single plant hills 1 ft. apart in the row was the standard of comparison, while in all other trials the yield of 3-plant hills surrounded on four sides by 3-plant hills was used.

Considerable competition in selfed lines due to variation in stand was evident. While the general tendency was in the direction of increased yield per plant as the space between the plants increased, it seemed probable that 2-ft. spacing of single plants for the less vigorous strains permits maximum development, and for the more vigorous strains 3-ft. spacing permits more growth per plant than 2-ft. spacing. It appeared doubtful if competition extended much, if any, beyond the 3-ft. spacing. Results at both places suggested that when hills have reduced stand or are adjacent to hills lacking in stand and are harvested in a variety test, a rather large error may be introduced. Indications were that the response to missing hills or to hills with reduced stand may vary considerably from year to year, and that the response may be correlated with yield. Results for 1928 indicated a possible difference in the reaction of flint and dent strains for the experimental conditions.

**Fertilizers for cotton soils,** J. J. Skinner (*U. S. Dept. Agr., Misc. Pub. 126 (1931), pp. 10, figs. 3*).—Practical information on the use of fertilizers in growing cotton, based extensively on research of experiment stations in the Southern States and the U. S. Department of Agriculture, covers the analysis and composition of fertilizers for cotton soils and rates, time, and methods of applying fertilizers for cotton.

**The extent of vicinism in cotton at Clemson College,** G. H. Collings and R. W. Wallace (*Jour. Amer. Soc. Agron., 23 (1931), No. 6, pp. 490–492*).—Seed cotton was picked from rows of green-leaf varieties at about 10, 20, 30, 40, 50, 100, 150, and 200 ft. in several directions from a field of red-leaf cotton near the South Carolina Experiment Station. Germination tests of the seed showed only 16 seedlings, out of 2,075 seed germinating, to be hybrids. The red coloring matter was present in the tissue and was apparent as soon as the seed germinated, obviating field or greenhouse cultures. The prevailing winds during the flowering season evidently did not markedly influence pollination, the cross-fertilization which occurred probably being due almost entirely to insects. No vicinists were found farther than 40 ft. from the red-leaf cotton.

**Technological reports on standard Indian cottons, 1931,** N. Ahmad (*Indian Cent. Cotton Com. [Bombay], Technol. Bul., Ser. A, No. 18 (1931), pp. IV+116, figs. 23*).—The present edition, resembling earlier reports (E. S. R., 63, p. 796) in scope, includes the results of textile tests on the standard Indian cottons of the 1930-31 season and summarized data on the seasons 1923 to 1931, inclusive.

**Some effects of straw mulch on yield of potatoes,** J. Bushnell and F. A. Welton (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 9*, *pp. 837-845*, *figs. 4*).—Straw mulch (E. S. R., 62, p. 36; 63, p. 35) applied to Russet Rural potatoes at the Ohio Experiment Station did not affect yields consistently over 3 seasons, whereas in southwestern Ohio mulch applied to early potatoes after the plants were up increased yields for 2 seasons an average of 61 bu. per acre. A similar mulch at planting retarded early growth and was not so beneficial. Straw applied at less than 8 tons per acre did not suppress annual weeds. The straw mulch reduced the soil temperature below that of cultivated plats, conserved soil moisture, and depressed the nitrates.

**Rice: Production and commerce,** E. García Montesoro (*El Arroz: Cultivo y Comercio. Madrid: Espasa-Calpe, 1929, pp. 222, figs. 21*).—This practical manual intended for conditions in Spain discusses the botanical and varietal characteristics of rice; its climatic, soil, cultural, and harvesting needs; insect pests, diseases, and other factors reducing yields; producing areas; and the commercial movement of the crop.

**Proceedings of the American Soybean Association** (*Amer. Soybean Assoc. Proc. 2* (*1928-1929*), *pp. 109*, *figs. 65*).—The ninth annual meeting of the association (E. S. R., 60, p. 135) held in Indiana in August, 1928, and the tenth meeting held in Ontario in August, 1929, are reported on, together with papers presented on the breeding, growing, and utilization of soybeans.

**Cultivation of the sugar beet crop: Three years' investigations of the effects of spacing,** W. M. Davies (*Jour. Min. Agr.* [*Gt. Brit.*], *37* (*1931*), *No. 10*, *pp. 973-985*, *fig. 1*).—Conclusions based on results of spacing experiments with sugar beets at the Harper Adams Agricultural College during 1927, 1928, and 1929 were in general harmony with those noted earlier (E. S. R., 64, p. 30).

**Estimation of the yield of sugar-beet from experimental plots: Observations on the use of a sample of 50 beet,** F. J. Dudley (*Jour. Min. Agr.* [*Gt. Brit.*], *38* (*1931*), *No. 5*, *pp. 494-498*).—Estimation of the weight of clean sugar beets on a plat from the total weight of dirty beets and the dirt-tare of 50 sampled beets may sometimes lead to considerable errors for single plats. During the experiments noted above, replication (in 1928) tended to reduce such error and gave on the average yields slightly below actual values but reliable for experimental purposes. Calculation of the weight of clean beets on a plat from the number of beets and the weight of a sample of 50 beets gave quite unreliable results, even with fourfold replication.

**Tobacco fertilizer recommendations,** C. B. Williams et al. (*Amer. Fert.*, *75* (*1931*), *No. 8*, *pp. 34*, *36*).—The recommendations resemble in scope those noted earlier (E. S. R., 64, p. 30).

**Results of varying rates of seeding wheat,** H. H. Finnell ([*Oklahoma*] *Panhandle Sta.*, *Panhandle Bul. 34* (*1932*), *pp. 9-15*).—Seeding tests with wheat within the period 1920-1931, inclusive, indicated that the usual acre rate of 30 lbs. on heavy soils is most productive under favorable conditions. The rate can profitably be increased from 5 to 10 lbs. if conditions do not favor immediate germination and establishment ahead of cold weather.

**A new method for the rapid estimation of moisture in wheat,** E. F. Burton and A. Pitt (*Canad. Jour. Research*, *1* (*1929*), *No. 2*, *pp. 155-162*, *figs. 4*).—The rapid method of estimating the moisture in a sample of wheat, described in this contribution from the University of Toronto, depends on the effect produced in a specially arranged radio circuit in which an alternating current of high frequency is generated. Introduction of a container holding some of the test wheat into the rapidly alternating electric field results in a change in the strength of the current measurable by an ammeter in the circuit and possible to be immediately interpreted as a measure of the moisture content of the wheat.

**The action of toxic agents used in the eradication of noxious plants,** R. B. Harvey (*Jour. Amer. Soc. Agron., 23 (1931), No. 6, pp. 481-489, figs. 4*).—Ethylene oxide and propylene oxide, according to results in Minnesota Experiment Station studies, may be useful in the control of such noxious plants as barberry, poison ivy, prickly-ash, etc. They have advantages over current methods in ease of handling, in toxicity in small concentrations, and in rapid release from the soil, thereby shortening the time of unproductivity in comparison with chlorates and chlorides.

**The eradication of prickly-pear by chemicals, with particular reference to emulsions in the systems phenols-gelatin-aqueous arsenic acid,** R. M. Woodman and W. J. Wiley (*Jour. Soc. Chem. Indus., Trans., 50 (1931), No. 22, pp. 187T–189T*).—When spraying for the control of pricklypear, emulsions containing aqueous arsenic acid solutions and the cresols as liquid phases, with gelatin or glue as the emulsifier, should, according to the studies reported, preferably be of the aqueous arsenic acid-in-cresols type.

**The control of weeds,** W. S. Ball, B. A. Madson, and W. W. Robbins (*Calif. Agr. Col. Ext. Circ. 54 (1931), pp. 68, figs. 7*).—The weed problem in California is described, the most practical and promising methods currently employed in weed control are outlined, and regulatory phases of weed control are summarized. Special attention is accorded weeds in the several crops and to puncture vine, morning-glory, Johnson grass, camel's thorn, Russian knapweed, hoary cress, Bermuda grass, and willows.

## HORTICULTURE

**[Horticulture at the Arkansas Station]** (*Arkansas Sta. Bul. 268 (1931), pp. 35, 36, 50-52, 53-55, 56*).—Results of studies in tomato nutrition conducted by G. Janssen, R. P. Bartholomew, and V. M. Watts indicated that nitrogen is the determining factor for the production of either a vegetative or a woody plant. The phosphorus and potash elements in the nutrient solution did not materially affect the percentage of total carbohydrates or nitrogen in the plant. When the nitrogen was supplied in full amount and the phosphorus or potash decreased to one-third the full quantity, the percentage starch was apparently decreased and sugars increased. Vegetative development and fruitfulness depended upon the nitrogen-carbohydrate relationship. High carbohydrates and low nitrogen, or the reverse, tended to unfruitfulness and in many instances also reduced growth. When phosphorus or potash, more particularly the latter, was reduced in the nutrient solution by one-third, the percentage nitrogen in the plant was materially increased. Apparently phosphorus and potash functioned in some way in cell activity leading to active growth provided the prerequisite nitrogen and carbohydrates were present.

Studies by J. R. Cooper and C. B. Wiggans upon the pollination of the apple showed that in the case of certain self-sterile varieties pollen tubes may reach the ovary within 24 hours but that in some cases the nuclei lag in their movement. Pollen tubes checked by cold did not often resume their original rapid growth with the return of warmer weather.

Working with *Lilium longiflorum giganteum*, Watts found that the moisture supply may be a factor in determining self-sterility. Under shade, variations in the nitrogen supply had no significant effect, but in other treatments increased nitrogen was associated with an increase in the percentage of successful self-pollinations. Self-sterility in this lily was not found to be associated with variations in the rate of pollen tube growth, such as induced by the fertilizer, water, and light treatments tested.

Working with Stayman Winesap, Delicious, Jonathan, and Ben Davis apples, Cooper found a fairly normal development of the chromosomes up to the tetrad stage. Abnormalities in chromosome division were observed in all four varieties, more especially in the Stayman Winesap, in which there was noted a splitting of the group, and not infrequently straggling chromosomes were found outside the nuclear membrane when the tetrads were formed. Malnutrition apparently aggravated abnormal behavior.

As observed by Watts, tomato varieties differed with respect to length of the style, short styles facilitating successful self-pollination and long styles preventing success. Environment influenced style length, as in 1931 during a period of high temperature and drought Norton, Marglobe, and Break o' Day produced exceptionally long styles. Moderately succulent and vigorous plant growth was found associated with maximum abilility of tomato plants to set fruits. The amino nitrogen-carbohydrate relationship was found closely connected with plant performance.

Studies conducted by Cooper and Wiggans in a young bearing apple orchard cover cropped and uniformly fertilized with superphosphate showed no material differences between nitrate of soda, ammonium sulfate, and cyanamide. Potash yielded entirely negligible results. Benefits from fertilizer were so slight in the station vineyard that no definite value could be assigned to any treatment. Peaches growing at the Fruit and Truck Substation failed to respond in growth to either phosphorus or potash, and no differences could be observed between nitrogen, phosphorus, or potash obtained from various sources.

As reported by Cooper and Watts, cantaloupes at the Fruit and Truck Substation responded best to a complete fertilizer. Strip fertilizing was more effective than broadcasting, and supplemental applications of ground limestone increased yields 100 per cent above those obtained with fertilizer alone.

Apple pruning studies summarized by Cooper and Wiggans showed that heavy pruning over a period of six years had decreased yield as compared with light or no pruning. Wiggans found that on healthy grapevines there was a correlation up to 150 buds per vine between buds left at pruning and yield. Vines trained to the Munson system were slightly more productive than those on any other system. Spur renewal was decidedly inferior to long renewal. Shoots from lower canes were longer in 1930 than those from upper canes, and shoots starting from near the tips of the canes averaged more and larger clusters of fruit. Shoot from upper canes were more efficient than those from lower canes.

Watts reports that in 1931 unpruned tomato plants yielded 18.9 lbs. at the first harvest as compared with 99.3 lbs. for plants pruned to one stem and staked. Marglobe proved the outstanding wilt resistant tomato, and Marvelana proved quite resistant to Septoria leaf spot. Observations are made by Cooper on the desirability of various ornamentals.

The shading of grapes was observed by Wiggans to increase uneven ripening and to delay ripening. Girdling of the trunks tended to overcome the harmful effects of shading, but by no means overcame it. Root pruning was harmful as concerned ripening, the severer the pruning the more pronounced the effects. Shading in addition to root pruning aggravated uneven ripening. Vines with leaves covered with lampblack produced more uneven ripening fruits than did whitewashed vines, and both treatments were unfavorable as compared with no treatment. Winter pruning decidedly lessened uneven ripening

Anatomical studies by Watts, Janssen, and Bartholomew upon stems of tomato plants grown under different nutrient conditions showed certain variations in cell structure, size, and shape attributable to the treatments.

Vetch was found by Cooper and Wiggans to be one of the most dependable cover crops. Wiggans reports only fair success with solar propagating frames.

**[Horticulture at the Delaware Station]** (*Delaware Sta. Bul. 172 (1931), pp. 37-41*).—Studies by L. R. Detjen and L. H. Strubinger upon the causes of dropping of immature fruits indicated that the curculio is a considerable factor in increasing the number of fruits shed in the so-called June drop. Entire trees were covered with cheesecloth tents, and the falling fruits collected daily on large metal screens. Curculio activity apparently did not change the time of natural dropping or influence the number of drops up to and including the June drop in the case of the variety studied. No jarring of trees was practiced, with the result that large numbers of dried small fruits remained in the trees; in fact, jarring was finally resorted to in the apple to dislodge these dead fruits, and in the peach hand picking was necessary.

As reported by Detjen and Strubinger, extreme drought interfered with the study in cabbage inheritance. However, evidence was obtained that the annual blooming type of cabbage had become practically fixed, since only occasional biennial plants appeared. Biennial plants obtained from the progeny of annual plants produced mostly biennial plants, with a few annuals scattered among them. The bolting plant of 1929 in a strain of Round Headed yielded largely leafy annual progeny with some biennials. In the case of a twin plant in which the two portions bloomed at different times, it was observed that each half transmitted its time of blooming to its progeny. Observations on the inheritance of the *asparagodes* type found in 1929 showed 100 per cent inheritance of this character in one line, with less in other strains.

Observations in 1930 by Strubinger, C. A. McCure, and Detjen on the relative effects on the peach of nitrogen derived from different sources showed wide differences in the average yield per tree of the four better treatments and the average yield of the four poorer treatments. Trees receiving half their nitrogen as nitrate of soda and half as ammonium sulfate were most productive in both the 6- and 7-year yields, but in the 8-year average the results showed very slightly in favor of dried blood. All treatments exceeded the controls in all the three periods.

In a cover crop and fertilizer study with the peach F. S. Lagassé found that check trees ripened their fruit at one time and yielded maturer and better colored fruits. Lagassé found that the Gallia Beauty or Red Rome apple compared quite closely with the original Rome with respect to pollinating capacities. Tests of Williams, Rome, and Gallia Beauty pollen on Nyack Pippin blooms gave 10.3, 9.3, and 7.9 per cent of set, respectively.

**[Horticulture at the New York State Station]** (*New York State Sta. Rpt. 1931, pp. 40, 42, 43, 71-74, 75-92, 93-95*).—McIntosh apples with only a trace of red or unevenly colored attained full red in from two to three days upon exposure to full sunlight. The wave lengths most efficacious in color formation were found to lie between 3,600 and 4,500 a. u., that is, between the visible range and the ultra-violet.

Studies of the composition of squashes and pumpkins revealed striking differences between varieties. Certain squashes were characterized by comparatively high amounts of dry matter, due largely to high starch content. Such varieties yielded a canned product of high consistency. High starch was generally correlated with high total solids and high insoluble matter. The greatest changes occurring during ripening were increases in weight and in the proportion of dry matter to total weight. The relative amounts of various chemical constituents remained fixed to an unexpected degree. The toughness of the shells apparently increased without passing through a maximum.

Examinations of apples and cherries showed higher spray residues than usual, due to the dry conditions prevailing during the growing period. Washing machines using dilute hydrochloric acid were highly efficient in removing spray residues, more so than were commercial dry cleaners.

A McIntosh orchard under strip cultivation for some years and then placed in quack grass responded markedly to nitrogen but very little to phosphorus and potassium. Similar results were obtained in a Rome orchard in quack grass sod. Marked variations were observed in the availability of different nitrogen fertilizers as applied over a period of years in four orchards containing three different varieties of apples.

In a study of the reaction of the tissues of the apple tree to applications of nutrient salts it was found very difficult to obtain duplicate samples of tissue which did not vary greatly in composition. Stage of maturity was an important feature, growing tissue showing the effects of nutrients more readily than did mature tissue by being more variable.

Mention is made of several promising new fruits, namely, the Gorham pear, the Early Rivers, Emperor Francis, and Victor cherries, the Stanley, Hall, and Albion plums, the Fredonia and Golden Muscat grapes, the Newburgh raspberry, and the Clermont, Culver, Cato, and Camden strawberries. A total of 1,539 peach, nectarine, and apricot seedlings, 109 cherries, 87 plums, 603 pears, 827 apples, and 1,264 grapes were set out in the testing plats in the spring of 1931.

Cytological studies of the sex cells of fruits indicated that the chromosome is made up of at least two substances, one of which, the stainable core, is termed the "chromonema." Ruthenium tetroxide was found useful in killing and fixing nuclear protoplasm.

Tests conducted in the Hudson River Valley of several nitrogen fertilizers showed none of the newer materials to be outstanding for apples and currants and indicated that the standard nitrogen fertilizers are equally as good if not better than the new.

Nursery investigations indicated the desirability of raising plum and cherry seedlings in one year without transplanting and of growing apple and pear seedlings in close plantings one year and then spacing more widely the second season so as to induce root branching. Cherry seed planted about October 1 gave good results, but when planted in late November or December gave poor germination the next spring. Apple and pear seeds were successfully handled by artificially after-ripening the seed and spring planting. Peat moss was found an excellent cover for seedling beds. As to sources of seed, cherry and plum stocks from the nonirrigated sections of America gave the best results. Among clonal rootstocks tested, Hatton XIII appeared especially promising for standard apples and Type IX for dwarf apples. A cover crop of white clover grown for two years greatly improved the tilth of nursery soil.

Counts of the number of 2-year-old Montmorency trees budded on Mazzard and Mahaleb stocks showed 49.1 and 54.1 per cent of survival, respectively. Cherry stocks from sections having long growing seasons were not as successful, in general, as those from localities where stocks ripened earlier. The time of digging was also a factor, stock dug as early as October 12 giving no plants of sufficient vigor the next summer, whereas those dug November 15 gave a 54 per cent stand of vigorous seedlings. Mahaleb roots withstood poor drainage better than Mazzards but not as well as Myrobalan plum and chokecherry. Leaf spot often interfered with the success of budding on Mazzard roots by causing early defoliation, and such stocks offered less resistance to winter injury. Sprayed Mazzards showed no winter injury.

The rooting of mounded apple and quince stocks was increased notably by broadcasting granulated peat between the rows and working it into the soil during the regular cultivation and mounding operations. The quality of the rooted plants from the peat-treated areas was superior. Stocks that rooted readily from layers were less benefited by peat than were difficult types.

Observations on the growth of sweet cherry trees obtained from different nurserymen and stored under the same conditions showed marked differences in survival, varying from 7 to 100 per cent. Coating with paraffin and wax and trenching in sand proved of no significance, but there was some slight benefit from pruning prior to storage.

In fertilizer studies with vegetables, the highest returns were secured when liberal amounts of phosphorus were applied. When the phosphorus deficiency was met, nitrogen and potassium also increased yields, provided phosphorus was also increased. The continuous cropping of peas resulted in failure after the third year, and even when grown in a 4-year rotation the results were such as to indicate the need of a longer interval. Tomatoes grown continuously on the same soil produced satisfactorily, but at the end of 5 years yielded 30 per cent less than tomatoes grown in rotation. A 1,200-lb. per acre application of 4–16–4 fertilizer was more profitable with tomatoes and cabbage than lesser amounts, but for beans, peas, sweet corn, and beets from 300 to 600 lbs. was all that could be applied profitably. Of four nitrogen fertilizers, nitrate of soda, ammonium sulfate, Ammo-Phos, and Calurea, used as side dressings for tomatoes, the ammonium sulfate was most profitable.

Experiments in cooperation with the U. S. Department of Agriculture in the placing of fertilizers for corn, beans, and peas showed the desirability of placing the fertilizer close to the seed but not in actual contact. Three highly promising strains of John Baer tomato were developed by breeding and selection. Time of sowing experiments with tomatoes showed better results from delayed seeding, March 25 and April 10, than from early plantings, March 10. Sowing tomatoes directly in the cold frame and moving the plants thence to the field gave satisfactory results, especially when an extra inch of soil was filled in about the plants in the frames. The application of complete fertilizer to tomatoes in the flats apparently hastened maturity and increased yields.

Golden Sunshine was the earliest of 30 yellow sweet corns tested. Hybrid inbred strains of Golden Bantam were remarkably uniform and yielded almost twice as much as open-pollinated strains. Despite the greater cost of inbred seed, the net profits were greatly increased. Yields to the farmer were considerably higher from sweet corn harvested for the cream style pack than for the whole kernel pack.

Pea breeding begun in 1926 yielded some promising strains. Over a 6-year period early planting of peas gave the best results, despite the fact that freezes and snow frequently followed the earliest plantings. Rain or snow immediately following planting resulted in poor germination. Among promising new peas tested were Maryland Alaska, Early Canner, Profusion, and Rice Producer.

The Golden Delicious squash was found to yield a firm canned product and is suggested for blending with more watery varieties. The Connecticut Field pumpkin outyielded Golden Delicious but yielded less in terms of the canned product.

Notes are given on 340 varieties of beans consisting of Limas and bush and pole varieties tested during the year. A promising dark green seedless strain of the Geneva cucumber was isolated in the greenhouse.

**[Horticulture at the Porto Rico Station]**, T. B. McClelland, R. L. Davis, and H. C. Henricksen (*Porto Rico Sta. Rpt. 1930, pp. 14–16, 19–21, 35–38, fig. 1*).—Favorable results secured with the Excelsa variety of coffee led to its recommendation for areas not suited to Arabian coffee because of soil depletion, sun exposure, or leaf miner injury. Large quantities of Excelsa and Arabian coffee seeds were distributed. *Gliricidia sepium*, a legume tree found well adapted at the station as a shade plant for coffee, was widely disseminated for trial. Well-fertilized Arabian coffee plants recovered more satisfactorily following the hurricane than did undernourished plants. Plats receiving complete fertilizer at Las Vegas outyielded the controls more than 2.5 times. Ammonium sulfate proved a better source of nitrogen in complete fertilizers for Bourbon coffee than did nitrate of soda.

Wide differences found in the production of individual coconut palms receiving the same fertilizer treatment are ascribed to inherent differences in the plants.

The Venezuelan Black bean greatly outyielded the Full Measure and Burpee Stringless Green Pod varieties but was inferior in quality. Of five pole beans tested White Creaseback was the most productive, with Kentucky Wonder second.

Mayaguez-1 sweet corn, as tested by several planters, was rather too small in the ear. First generation crosses were made between Mayaguez-1 and certain starchy selfed lines. Corn was found too young for harvesting as long as any of the silks were living and resisted pulling from the ear. When harvested within a day or two after the silks had decayed the corn was prime for eating.

Analysis of portions of citrus trees showed a rapid change in some of the carbohydrates and proteins unless the tissues were frozen immediately upon separation from the tree and kept frozen until needed. The moisture content of the leaves varied with that of the soil and air and with the species, but principally with the vegetative condition of the tree. Old, mature leaves from a normal grapefruit tree contained about 60 per cent of moisture, whereas new, partly developed leaves contained from 70 to 77 per cent. Neither nitrate nor ammonia nitrogen was found in any of the leaf tissues. Total nitrogen varied from about 2 per cent in the old leaves to 3.5 per cent in the young leaves. The amount of nitrogen extracted from fresh tissue with 80 per cent alcohol was a fairly constant percentage of the total, irrespective of the age of the leaf. Pentoses were not found in appreciable quantities. Monosaccharides, chiefly glucose, were always considerably higher in young leaves. Disaccharides varied with the time of day that samples were taken. Polysaccharides differed with the age of the leaf and with the time of day that leaves were collected. Glucosides varied with the species and with vegatative vigor. Oxidase was not found. Peroxidase was present in abundance. Reductase and tyrosinase were not present. Catalase varied with the vegetative vigor of the tree. Diastase was plentiful in leaves of normal trees, being higher in partly mature than in very young or very old tissues, and invertase was present in all tissues examined.

Observations on plant-ripened and green pineapples held at 40° F. for several days showed the green fruit to assume the usual yellow color and the plant-ripened fruit to undergo very little change. Smoking pineapple plants induced them to bloom in advance of the regular period.

**[Horticulture at the Virginia Station]** (*Virginia Sta. Rpt. 1928–1931, pp. 39–42*).—Trials conducted over a period of three years to determine the effects of applying nitrogen fertilizers at different times of year to Stayman Winesap apple trees showed an increased yield in every case, irrespective of the time the fertilizer was applied. The average annual yield per tree from the plats which received ammonium sulfate, regardless of time applied, exceeded the yield of trees given nitrate of soda in March, though the latter trees yielded 66 per cent more than did the check trees.

A comparison over a period of six years of single and split applications of nitrogen fertilizer for York Imperial apples in an orchard near Winchester showed a significant gain in favor of splitting the application.

Fall and spring applications of nitrogen fertilizer compared in a 16-year-old York Imperial orchard near Blacksburg were not found significantly different in their effect on yield, but the 4-lb. fall application of nitrate of soda did produce significantly longer terminal growth than was produced by the spring-fertilized trees.

Experiments conducted over a period of four years indicated that the paper carton is a satisfactory package for marketing apples.

**[Horticulture at the West Virginia Station]** (*West Virginia Sta. Bul. 244* (*1931*), *pp. 31, 32, 33–36*).—Studies by H. E. Knowlton upon the pollination requirements of apples showed practically all varieties to set little fruit when self-pollinated, York Imperial being the only variety capable of producing a commercial crop when selfed. Varieties of the Winesap group were completely self-sterile and also intersterile. Desirable combinations included Jonathan and Delicious, Jonathan and Grimes, York Imperial and Rome, and Northwestern and Delicious.

As determined by K. C. Westover and F. W. Craig, strains of Earliana tomato were the most productive during the early season, with Bonny Best leading over the entire season.

Concerning the effect of available nitrogen fertilizers on the keeping quality of Black Twig and Stayman apples, Knowlton and M. B. Hoffman found no decrease in keeping quality as a result of fertilizer treatment, but the fruit of nitrated trees was poorer in color and somewhat softer in texture. The authors point out that poorly colored apples scald more readily in storage, are often too ripe when picked, and are inferior in dessert qualities. When both nitrate of soda and ammonium sulfate were applied to apples several weeks before blooming the results were equally satisfactory, but when applied at blooming time the nitrate of soda was superior.

As established by H. L. Crane, peach trees with large amounts of stored reserves suffered less bud killing than did trees with limited reserves. The maintenance of healthy foliage late in the season is deemed important, as is also fruit thinning to prevent overbearing. Light pruning of apples, peaches, plums, and cherries for the first few years produced larger and earlier fruiting trees than did heavy pruning.

As reported by A. P. Dye, double-stemmed tomato plants yielded more fruit than did plants with single stems or plants with the double stems tied together.

Paper mulch experiments conducted by Westover, F. W. Craig, and E. N. McCubbin at Morgantown and at the Lakin Experiment Farm gave contrasting results. On the clay loam at Morgantown paper mulch more than doubled the yields of peppers, eggplants, and string beans, while at Lakin the increases from paper were insignificant.

Late thinning, 4 weeks before harvest, of Elberta peaches was found by Knowlton and Hoffman to give as good results measured in fruit size as did thinning soon after the June drop.

As determined by Dye, bentgrasses and mixtures containing Kentucky bluegrass, redtop, and white Dutch clover were best for lawns. The fescues were difficult to cut, tended to bunch, and were unattractive in appearance.

**Flower pot composition and its effect on plant growth**, L. H. Jones (*Massachusetts Sta. Bul. 277 (1931), pp. 147–161, figs. 4*).—Clay flower pots were found to adsorb a considerable portion of the water applied to the soil within the pot. In a period of 6.5 hours porous pots lost by evaporation more than twice the moisture given off by nonporous pots. As a result, at the height of day soil in porous pots was considerably cooler than that in the nonporous pots. At 12 noon the temperature of the soil mass in 3-in. containers of clay, paper, peat, fiber, and glass was 86, 102, 85, 90, and 105° F., respectively, yet no evidence was obtained of any effect of soil temperature on plant growth.

The poor growth obtained in plain paper and paraffined paper pots was overcome by watering with an ammonium sulfate solution, indicating a shortage of nitrogen, evidently used up by the organisms engaged in decomposing the pot itself. When the fibers of the pot were properly waterproofed it was found that as good plants could be grown in paper containers as in glass. The most practical paper pot was one in which the fibers were impregnated and bound together with asphalt. Glass containers proved very satisfactory provided enough water was added to barely moisten the soil. Rubber pots coated with Bakelite varnish, with asphalt, and uncoated all proved satisfactory for growing plants.

**Onion culture**, W. O. Strong, H. H. Zimmerley, and H. T. Cook (*Virginia Truck Sta. Bul. 72 (1930), pp. 837–859, figs. 8*).—In connection with a general discussion of onion growing, harvesting, and marketing, and of fungus and bacterial diseases and insect pests, information is offered on the results of fertilizer tests conducted at Onley, Va., from 1926 to 1930 with Ebenezer onion sets planted 4 in. apart in the row and with 28 in. between the rows. In general the treatments showed the importance of phosphorus, fertilizers without phosphorus giving the lowest yields each year. Phosphorus deficiency was evident in lighter green leaves and slower growth as well as decreased yield. The highest average total yield was secured on a 4–10–8 (N–P–K) plat.

**The response of apples, cherries, and roses to fertilizer applications in the nursery**, H. B. Tukey and K. D. Brasl (*New York State Sta. Bul. 599 (1931), pp. 23, figs. 4*).—Fertilizer studies with McIntosh apples budded on French Crab and with Montmorency cherries on French-grown Mazzard roots led to the general conclusion that on fertile, well-drained soils of western New York apple and cherry nursery stock when well cultivated does not respond to applications of either natural or commercial manures. Tests with hybrid tea roses budded on *multiflora* roots were not at all conclusive, due to winter injury, but did suggest a response to nitrogen in greater growth and also in greater susceptibility to winter injury.

The data from the apple and cherry experiments showed significant differences between certain treatments, but the differences were of such small magnitude as to have in the author's opinion no practical consideration. Drainage of soil was an important factor with cherries, these being injured by excesses of moisture which had little or no effect on apples and roses. The uniform growth of the nursery trees suggested that the growth rate was governed more closely by such general climatic conditions as rainfall and temperature and by stored food materials than by applied fertilizers.

**Growing an orchard in Kansas**, R. J. Barnett (*Kansas Sta. Bul. 254 (1931), pp. 44, figs. 18*).—In addition to general information on the management of fruit orchards, the results of several experiments are presented. No material differences that could be attributed to fertilizer treatment were found either in growth or yield of clean-cultivated apple trees fertilized with various commercial materials and with manures. Of cover crops tested, winter vetch, rye, wheat, and Austrian field peas were found to be hardy, and of these four winter vetch and rye were the most valuable. The yields of air-dry material from plats on which 20, 30, and 40 lbs. of winter vetch seed was used per acre were 4,460, 4,812, and 5,750 lbs., respectively, the cost of the nitrogen obtained being 4.2, 4.5, and 4.9 cts. per pound.

**The effect of pruning apple trees at planting time,** J. Oskamp (*New York Cornell Sta. Mem. 138 (1931), pp. 50, figs. 9*).—Using 2-year-old Baldwin, Delicious, McIntosh, Northern Spy, and Rhode Island trees carefully graded and measured prior to planting in replicated plats, the author found that the severer the pruning at planting time the less the weight of the tree at the end of the first and second years. However, by the end of the third and fourth seasons the effects of initial pruning were negligible except in the case of trees pruned to a whip at planting. Heavy pruning resulted in slightly less loss of trees following transplanting, in a larger percentage of early opening buds, and in fewer growing points but longer and heavier terminal growth.

Weights of the trees obtained before planting when correlated with the weights of the above ground portion after four seasons in the orchard gave some indication of a positive relationship.

In general conclusion the author points out the desirability of doing sufficient pruning on the 2-year-old apple tree at time of planting to correct existing framework defects. Delaying this corrective treatment until the tree has become established is considered less desirable.

**Some recent results in apple sterility studies,** H. E. Knowlton (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 62–64; abs. in West Virginia Sta. Bul. 244 (1931), p. 54*).—Briefly discussing the technic employed at the West Virginia Experiment Station in pollination studies, the author presents certain results obtained. The percentage set on six limbs of a Rome tree each pollinated with Northwestern Greening were 3, 3, 35, 8, 0, and 0, respectively. The percentage set, after the first drop, of Delicious pollinated with York, Grimes, Golden Delicious, Stayman, and Delicious were 24, 21, 34, 0, and 0, respectively, indicating that Delicious is self-sterile and that Stayman pollen is ineffective on Delicious. In the open orchard Delicious when planted in solid blocks set some fruit. Rome set practically no fruit when pollinated with Rome or Stayman. Delicious, York, Grimes, and Golden Delicious proved satisfactory pollinizers for Rome. Rome × Gallia Beauty resulted in an unexpectedly high percentage of set.

**Effect of hydrogen-ion concentration on the growth of strawberries in sand and in soil,** C. S. Waltman (*Kentucky Sta. Bul. 321 (1931), pp. 331–352, figs. 7*).—Observations on new runner plants of the Mastodon Everbearing strawberry grown in the greenhouse in sand and in soil in which the reaction was maintained artificially over a pH range of 3 to 9 showed the best growth at a reaction of about 5.3 to 5.5. The response of soil-grown plants was very similar to that of sand-grown plants, but because of the buffer action of the soil the toxicity of extreme acidity or alkalinity was less marked and the action slower than in sand. Acidity at pH 4 was more harmful to plants than was alkalinity at pH 8. In all experiments growth was better and fruiting larger at acid than at alkaline reactions. The reactions most favorable to growth were also most favorable to fruiting.

Analyses of the plants for total nitrogen, nitrate nitrogen, total phosphorus, and phosphate phosphorus showed a distinct connection between soil reaction and composition. A tendency was noted toward the storage of total nitrogen in the crowns at the reactions most favorable to growth. Strawberries evidently required a relatively large amount of phosphorus. The reaction of the soil apparently influenced the availability of phosphorus and acid reaction favored phosphorus utilization. However, the author believes that enough lime may be added to the soil to promote the growth of clover without making the soil reaction too alkaline for strawberries.

**Strawberry growing in Kansas, R. J. Barnett** (*Kansas Sta. Circ. 162 (1931), pp. 15, figs. 6*).—Information of a general nature is presented.

**The use of performance records in laying out a raspberry fertilizer experiment, M. B. Hoffman** (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 203–207, fig. 1; abs. in West Virginia Sta. Bul. 244 (1931), p. 55*).—A statistical analysis of yields taken in 1929 following the laying out of a proposed fertilizer trial with the Latham raspberry but prior to the actual application of the fertilizers indicated that trustworthy results may be expected from the use of 30-ft. single row plats. The author expresses doubt whether this accuracy could be doubled without increasing plat length to impracticable limits. In comparing two plat lengths the differences were considered entirely significant if the difference between their standard deviations was three or more times its probable error. In no instance did a plat length difference of 10 ft. give a significant value.

## FORESTRY

**A study of organic factors concerned in the decadence of birch on cut-over lands in northern New England, P. Spaulding and H. J. MacAloney** (*Jour. Forestry, 29 (1931), No. 8, pp. 1134–1149, figs. 8*).—Discouraging results with small trees of paper birch (*Betula papyrifera*) and yellow birch (*B. lutea*) left after cutting led to a study which showed that the bronze birch borer (*Agrilus anxius*) and the root rot fungus (*Armillaria mellea*) were important factors in the rapid decadence of young birch trees. Following release the remaining trees were subjected to a drastic change in environment, greater solar intensity, greater drying in summer, and more severe freezing in winter, all of which tended to weaken the trees' resistance to insects and fungi. Incidentally logging injuries afforded an entry to fungi and to some extent to the borers. The authors suggest that relatively young trees should be chosen for release, especially in the case of paper birch, and that yellow birch should be released gradually and greater care exercised in logging so as to reduce injury to the remaining trees.

**The effect of pure coniferous stands on hardpan formation: A hypothesis, E. R. Martell** (*Jour. Forestry, 29 (1931), No. 8, pp. 1173–1177*).—The suggestion is made that the planting of pure stands of conifers on lime-containing soils may possibly induce the formation of hardpan, which interferes with aeration, water and root movement, and finally with the welfare of the trees. The hypothesis is advanced that the greater acidity of the percolating waters under a pure conifer stand would tend toward a more rapid solution of the iron and aluminum compounds and their concentration in the subsoil to form hardpan.

**Preliminary observations on the use of clear cut strips in handling black spruce, T. Schantz-Hansen** (*Jour. Forestry, 29 (1931), No. 8, pp. 1168–1172, fig. 1*).—The clearing in 1927 of strips about 75 ft. wide through a dense stand of black spruce approximately 120 years old was followed by rather heavy losses, 17 per cent of windthrown and 15 per cent of mortality, in the remaining trees in the following four seasons. However, from the standpoint of regeneration, the strip method of cutting is considered very satisfactory, the clear-cut area averaging 9,333 seedlings per acre and the uncut strips 12,762. Only 5.4 per cent of the seedlings were advance reproduction.

The annual collection of sphagnum moss from the swamp is believed a factor in the results, since in an adjacent uncut stand reproduction occurred only where the moss had been gathered. In conclusion the author suggests that strip cutting should be a successful method of reproducing black spruce where the timber is mature and is to be completely removed within the subsequent five years.

**[Soil moisture and the germination and growth of seedling forest trees]** (*Arkansas Sta. Bul. 268 (1931), p. 55*).—Studies conducted by J. R. Cooper upon the relation of soil moisture to tree seed germination and to the growth of young seedlings showed considerable differences in the requirements of different species. There was less effect from moisture variations with seedlings than with germinating seed.

**Western yellow pine seed extraction in the Black Hills, J. F. Conner** (*Jour. Forestry, 29 (1931), No. 8, pp. 1165–1167*).—A description is given of a simple yet successful seed extraction plant dependent on natural drying.

**Needle structure as an aid in distinguishing Colorado blue spruce from Engelmann spruce, H. F. Marco** (*Bot. Gaz., 92 (1931), No. 4, pp. 446–449, figs. 6*).—Working at Syracuse University, the author found that resin canals were lacking in most instances in the upper half of Engelmann spruce needles and invariably present in the Colorado blue spruce, suggesting a rather reliable means of distinguishing the two species provided an adequate number of needles are available for observation.

**Oleoresin production from longleaf pine defoliated by fire, E. Gerry** (*Jour. Agr. Research [U. S.], 43 (1931), No. 9, p. 827–836, figs. 5*).—Comparative records of oleoresin production of 40-year-old South Carolina longleaf pines, part subjected to ground fire and part to both ground fire and a crown fire sufficient to scorch the foliage but not to kill the new leaf buds, showed a markedly reduced yield of oleoresin in the first year following the fire; in fact, over 50 per cent of the scorched trees were killed outright or ceased to exude oleoresin. The surviving trees yielded very poorly but recovered, so that the yield of resin per tree increased during the next two years even under the exploitation of ordinary commercial turpentining.

An anatomical study of the wood collected from scorched trees in April following burning in November showed a retarded and enfeebled development of resin tissue, wood cells, and phloem. The reduction consisted chiefly of missing annual growth rings, poorly developed summer wood, and reduced oleoresin-producing tissues. The subsequent recovery of the injured trees gave striking evidence of the potential energy and recuperative power of the longleaf pine.

## DISEASES OF PLANTS

**[Plant pathology at the Arkansas Station]** (*Arkansas Sta. Bul. 268 (1931), pp. 57–64*).—In studies by E. C. Tullis upon the identity of organisms causing the seedling blight of rice and upon methods of control, apparently diseased seeds of three varieties were surface sterilized and planted singly on sterile corn meal agar. Dividing the fungi into two groups, fruiting and nonfruiting, there appeared in the first group Alternaria and Helminthosporium, and in the second group forms producing pycnosclerotia only. Over 50 per cent of the rice plants were killed by some fungus.

Attempts by D. G. Carter and Tullis to control stem rot of rice by burning the stubble before plowing were quite successful, the burned plats having an average of 17.1 per cent of stem rot as compared with 42.7 per cent for the checks. In a series of fertilizer treatments, G. Janssen and Tullis found no correlation between the percentage of stem rot and yield, although yields were increased by the fertilizers. Of 15 varieties tested for resistance, 5 yielded well.

As reported by Tullis, Janssen, and L. C. Kapp, the type of soil had no material effect in regard to the production of sterility or straight head of rice, but the treatment of any given soil appeared to be a factor. Aerated soils containing relatively large amounts of humus or organic matter tended toward sterility.

Studies by V. H. Young, J. O. Ware, and Janssen suggested that the incidence of cotton wilt is materially reduced by fertilizers containing potash and that rust or potash hunger is reduced on the potash plats. These results were confirmed in 4 of 6 other tests, and in 1 of the 2 negative tests the cotton was found to be badly affected with nematodes. Stable manure and potash fertilizers effectively controlled rust in a field at Scott. In a laboratory experiment, using glass jar cultures, no apparent control of cotton wilt was obtained by the use of potash fertilizers, nor was any correlation seen between cotton wilt and soil type. Analyses showed, however, a relatively high potash content in these soils. Applications of potassium to a rust-sick soil very low in potash materially decreased both wilt and rust. Heavy applications of manure were also effective in reducing rust.

That environment plays an important part in the rapidity of infection by cotton wilt was determined by Young. Low soil temperature apparently inhibited the early development of infection, and low soil moisture in midsummer also checked its progress.

Grape spraying experiments conducted by Young included a comparison of several materials for the control of black rot, excellent results being obtained with all mixtures.

As reported by Young and C. K. McClelland, slight increases in yield followed the treatment of seed corn with two commercial organic mercury materials.

H. R. Rosen found fire blight very destructive to apples in 1930, killing practically 100 per cent of the blossoms of susceptible varieties in some cases. On the other hand, pears were quite free of blight, and no relation could be seen between the presence of pear trees and the blighting of apples. The serious attack on apple blossoms led to the hypothesis that the carrying agent was a blossom visitor and that rain and wind likely had little to do with dissemination. Fire blight was isolated in summer and winter from beehives located in infested apple orchards. An organism quite different from the ordinary fire blight was isolated several different times from diseased pear material. No oozing occurred from overwintered material prior to the appearance of the first spring blight, suggesting that no correlation exists between first blossom blight and the overwintering in blighted twigs and limbs. Twig blight occurring in July was, however, traced to the previous year's blight.

The tip and margin burn of potatoes was not controlled in experiments at the Fruit and Truck Substation by applications of either Bordeaux mixture or monohydrated copper sulfate dust.

**[Plant pathology at the Delaware station]** (*Delaware Sta. Bul. 172 (1931), pp. 42–50*).—As reported by T. F. Manns, formaldehyde proved the most efficient and economical soil disinfectant for sweetpotato seed beds. Somewhat better results were secured, however, with clean soil than with formaldehyde. In the cooperative experiment with the Georgia Experiment Station, tomato plants grown in Georgia in beds sprayed with various materials were tested by Manns in regard to disease behavior in Delaware. All spray treatments were apparently beneficial as determined by survival and lower percentage of badly blighted plants.

No evidence was obtained by Manns that peach yellows or little peach is disseminated through the pollen carried by insects.

In studies by J. F. Adams upon diseases of cucurbits, the Persian variety of melon was found highly susceptible to anthracnose, and copper sprays or dusts failed to give control. Copper nitrate and copper sulfate supplied to plants in diluted form in an attempt to build up resistance proved toxic in all strengths used. The two most important diseases of soybeans, *Septoria glycines* and *Bacterium phaseoli sojense*, were reduced almost one-half in 1930 by the drought.

Adams, working on the bacterial spot (*Bacterium pruni*) of the peach, tested various mercuric compounds, hydrated lime, and Penetrol, without conclusive results due to a complication of arsenical burning. Using zinc sulfate in crystal and powdered forms with various brands of dry sulfur, Adams found that certain dry sulfur mixtures when combined with zinc sulfate reduced or eliminated the germicidal properties of the latter. Certain spray mixtures were found to carry a bacterial flora. Toxicity tests showed that *B. pruni* has a lower lethal point than *Bacillus amylovorus*. Blackleaf 40 (1–800) and lead arsenate (1.5 lbs. in 50 gal.) showed no germicidal properties against *B. pruni*, but lead arsenate added to Oxo-Bordeaux reduced the lethal point for both *B. amylovorus* and *B. pruni*. Buds taken from noninfected and infected Elberta twigs yielded isolations of *B. pruni* in only one case. Twigs infested with Oriental peach moth yielded no *B. pruni* and only 20 per cent of the twigs carrying *B. pruni* cankers yielded infection. Copper sulfate and zinc sulfate applied May 12 as a top-dressing to peach trees resulted in the development within 10 days of a typical shot hole effect in the older leaves, gradually progressing to the younger foliage. Analyses of the leaves of treated and untreated trees showed scarcely any difference in copper content, nor could any effect be seen on *B. pruni* infection.

The results of tests conducted by Adams of various spray materials and combinations thereof are presented chiefly in tabular form.

Isolations from root rot observed in the strawberry showed the consistent presence of an *Actinomyces* sp. Foliage injury of peach from sprays is said to be directly associated with the basic materials, namely, sulfur or lead arsenate, and indirectly with the vigor and age of the tree, the quantity of spray applied, etc. Sulfur injury usually appeared following late applications under conditions of high temperature and drought.

**[Plant pathology at the New York State Station]** (*New York State Sta. Rpt. 1931, pp. 29–35, 86, 92, 93*).—Studies in the control of root diseases of the pea showed that root rot is much more severe on untiled than on tiled land, and more destructive to peas growing between the tile lines than directly over them. The disease was worse on soil packed by the fitting tools than on unpacked soil. Observations on peas grown under irrigation showed that the disease develops more intensively in soil with high water content or with high water-holding capacity. The practical suggestion is made that peas be grown on well-drained soil. Several soil treatments, including the application of land plaster, gave promising results.

One unnamed seedling black raspberry was found highly klendusic (disease escaping) but very susceptible to red mosaic. In a stand of some 130 plants, only one showed the disease in a 3-year period, whereas in the Dundee variety, planted adjacently, high percentages of red mosaic were evident. Among red raspberry seedlings, the progeny of Newman × Herbert was outstanding in klendusity or immunity and resistance to both yellow and red mosaic. Seasonal weather conditions played a rôle in the outward manifestation of mosaic. Yellow mosaic in red raspberries was strongly expressed in 1930, while in 1931 difficulty was encountered in detecting its presence. On the other hand, red mosaic was strongly evident in 1931. The 1931 season was favorable for the minimum injury by red mosaic to the vigor of the fruiting canes of the black raspberry.

Although stimulation of growth sometimes followed the treatment of vegetable seed with copper and mercury compounds, no consistent benefit could be assigned. With Lima beans retardation of growth followed treatment with mercurials. Under soil and weather conditions favoring germination and rapid growth, no increase in stand followed the treating of seed with organic mercurials. Seed was safely dusted at any time, but mercurials in solution were harmful if applied more than a month in advance of planting. Hot water treatment was most harmful to seeds of low vitality and with strong seed was best used a short time prior to planting.

The severity of apple scab was found in experiments in the Hudson Valley to depend on the number of overwintering scabby leaves and on temperature and rainfall in the spring. The critical period of infection was from the time buds showed green until about 2 to 4 weeks after petal fall. The most important spray varied with seasons, but complete coverage was always important. The results of tests of various sprays for scab control are discussed. Lime-sulfur was superior to dry-mix where scab outbreaks were severe, and scab lesions on the foliage were satisfactorily burned out with lime-sulfur. It is suggested that lime-sulfur be always used in the preblossom, calyx, and perhaps the first cover sprays. Some evidence was obtained that scab may be controlled by lime-sulfur applied within two days after an infection period has begun, but such delayed treatments are not recommended except in emergency. The addition of copperas to lime-sulfur did not reduce foliage injury, but lime-sulfur and dry-mix used half and half was decidedly less harmful than lime-sulfur alone or lime-sulfur plus copperas. The vigor of the tree, the method of spray, and the amount of spray applied influenced the extent of the injury.

Of 300 odd lots of cabbage seed tested for germination before and after hot water treatment, only an occasional lot was injured.

**[Plant pathology at the Virginia Station]** (*Virginia Sta. Rpt. 1928–1931, pp. 28–34, 80*).—About 2,000 individuals of the apple family were tested for resistance to black root rot and none found fully immune. Attempts to control root rot by sterilizing with steam gave some promise, but acetic acid did not prove satisfactory.

Crosses were made between the navy bean and the Improved Goddard, and between Kentucky Wonder and Marblehead Pole in an attempt to develop rust resistant types. Resistance was found dominant, and segregation in the $F_2$ generation conformed in general with the Mendelian expectation. Some of the resistant Kentucky Wonder strains were found good enough for distribution.

Infection with ring spot of tobacco was secured on 37 different genera of plants representing 17 families. Among susceptible plants were tobacco, eggplant, cantaloupe, cucumber, pumpkin, watermelon, beans, cowpeas, okra, sunflower, and castor bean. Infection was obtained by swabbing, needle puncture, injections, and grafting, the most effective means being swabbing. The virus did not usually survive more than 24 hours in expressed juices, except at very low temperatures. The drying of infected leaves destroyed the virus.

Certain viruses from sweetclover, yellow ironweed, petunia, and squash produced ring spot symptoms in tobacco, but in a mild degree which suggested attenuated forms. The virus failed to hibernate in the roots of the pokeweed. Ring spot virus was precipitated and separated from juice with either alcohol or acetone and recovered in water without loss of infective capacity. Diluting

1 to 1,000 did not destroy infectiousness. No evidence was seen that the disease survives readily in the seed of tobacco, but was apparently easily transmitted through petunia seed.

Tomato plants became inoculated when grafted on diseased tobacco.

Juglone, isolated from the roots of the black walnut, proved toxic to alfalfa and tomato when injected therein. Differences in susceptibility are believed due to the capacity of various plants for reducing the toxic quinone to its hydroform.

Drought spot of tobacco was found to be a disease of the mature plant and to be increased by nitrogen applications and decreased by potassium and chlorine. Abnormal water relations in themselves did not produce drought spot, but when combined with a lack of vigor from other causes did influence spot appearance.

Rust resistant hybrid snapdragons obtained from Purdue University bred true for resistance, and some progress was made in the selection of the resistant types.

Studies at the Winchester field laboratory showed that the ascospores of apple scab under average conditions are not liberated before the middle of April nor later than the middle of June. There were 12 periods of ejection in the ordinary season. For the control of cedar rust, it is advised that all cedars be eradicated within two miles of apple orchards. The intensity of infection rated at 100 at 1 mile distance became 32 at 2 miles and 4 at 2.5 miles. Tests over a 13-year period showed rainfall to be the most important factor concerned in disease outbreaks. Chemical hydrated lime was found an excellent form of lime for making Bordeaux mixture. Thinning of apples increased total production and quality. Gray nickel flotation sulfur gave the best control of powdery mildew of the apple. Water core of apples disappeared during storage.

Studies at the Piedmont field laboratory showed calcium monosulfide to be an excellent new material for the control of apple scab and for the summer spraying of peaches. Waste sulfite liquor from paper mills was found a satisfactory substitute for calcium caseinate in the preparation of certain sprays. Zinc Bordeaux mixture was found a successful spray for the peach. The composition of a new dry-mix lime-sulfur known as the Virginia dry-mix is outlined.

**[Plant pathology at the West Virginia Station]** (*West Virginia Sta. Bul. 244 (1931), pp. 30, 31, 39–41*).—Crossing the Black Mesdag oat, a variety resistant to both loose and covered smut, with the Gopher, a high yielding but moderately susceptible variety, R. J. Garber and N. J. Giddings found that resistance to smut is a definitely inherited character. A few promising white-seeded resistant seedlings resembling the Gopher parent were obtained.

Garber and M. M. Hoover studying the susceptibility of a large number of inbred strains of corn to the smut disease found a wide range of susceptibility from extreme susceptibility to extreme resistance. The strains also differed markedly with respect to the portion of the plant affected. None of the immune strains had sufficient vigor or yielding capacity to make them valuable commercially but are being used in further hybridization.

Attempts by Garber and T. C. McIlvaine in cooperation with the U. S. Department of Agriculture to breed high-yielding root rot (Thielavia) resistant strains of tobacco by crossing the Maryland Mammoth, a high-yielding susceptible variety, with the resistant Burley strain were not successful, the hybrids being of poor quality.

Observations by C. R. Orton and A. Berg in an experimental orchard at Wardensville showed 11 of the 66 apple varieties present to be practically immune to cedar rust infection. In this group were Arkansas Black, Delicious, Fameuse, Gravenstein, King David, Kinnard, McIntosh, Mann, Northwestern Greening, Starking, and Wolf River. Another group of 13 varieties including Baldwin, Grimes Golden, and Winesap were found highly resistant. Some indication was obtained that red cedars may also differ in their susceptibility to cedar rust, and propagation of apparently resistant types was initiated.

Studies by L. H. Leonian upon the conditions surrounding corn root rot infection caused by *Fusarium moniliforme* suggested that the disease is relatively unimportant when infected seed is planted after the soil has become sufficiently warm to favor rapid growth of the seedling. Inoculum introduced into the soil near the roots caused little or no permanent injury when the weather was favorable to growth. Certain strains of the fungus isolated from diseased corn dissociated into many variants which differed with respect to sporulation, color, mycelial development, sensitivity to toxic substances, and in pathogenicity. It is believed that similar phenomena occur under natural conditions. Attempts to synthesize particular variants by mixing various strains were unsuccessful, and the results are believed to indicate the unlikelihood that new variants arise in this manner.

A Russian variety of watermelon was found by E. C. Sherwood to possess immunity to the wilt-producing fungus *F. niveum*. Unfortunately this melon is inedible, but it is being used in crosses with commercial varieties.

Two types of apple measles, namely, pustular measles and blister measles, were distinguished by Berg. The former displayed its maximum virulence on the Red Astrachan and the latter on Delicious. Pustular measles was infectious in the orchard.

Seven sprays of Bordeaux mixture increased the yield of potatoes more than 100 per cent above the checks, whereas dusting gave 35 per cent increase. It was evident that copper in liquid form is more effective than in dusts for controlling hopper burn, the chief cause of decreased yields.

Of 85 cultures of Phytophthora studied, 40 were found heterothallic. Of the remaining 45, some were homothallic and some showed no sexual reaction in any combination.

**Seed-borne parasites: A bibliography,** C. R. Orton (*West Virginia Sta. Bul. 245* (*1931*), *pp. 47*).—Discussing briefly the early history of seed transmission of parasites, their economic importance, manner in which pathogenes are seed borne, nature of the parasites, and commercial aspects, a list is presented of seed-borne parasites accompanied by the more important references and sometimes by brief mention of the manner of infection and of the method of control. The term "seed" is used in its botanical sense, and the paper does not, therefore, include mention of bulbs, corms, tubers, etc.

**Studies on the variability and dissociations in the genus Fusarium,** L. H. Leonian (*Phytopathology, 19* (*1929*), *No. 9, pp. 753–868, pls. 18; abs. in West Virginia Sta. Bul. 244* (*1931*), *p. 51*).—This account is prefaced by Sherbakoff, who, in referring to his own relevant statements previously noted (E. S. R., 33, p. 849), states that if emphasis be duly placed on the conditional variability, the facts in general now stand much as they did in 1915.

The present author states that, notwithstanding the great variability, the inconsistency of certain morphological and physiological characters, and the appearance of a number of new characteristics in many fusaria, a certain specific line of behavior persists throughout all of the strains and variants of a given fungus species. None of the tests, used alone or in combination, are considered as dependable for the identification of species or varieties, though if added to the more stable morphological and physiological characters such tests may solve some of the perplexing questions in the taxonomy of fungi. The presence of distinct strains and variants within the species and their decidedly different reactions are considered to indicate that the concept of the species should not be that of a single organism but that of a group of organisms having in general the same principal characters. It was intended to trace in these studies the variability of species of Fusarium and "to demonstrate the continuity of the specific path which is believed to persist in all the strains of a given species regardless of numerous sharp deviations from the known specific behavior."

The cultures, some 220 in number, used in this work comprised fusaria under 96 separate specific and varietal names. Some, originally received from different sources (2-7), have been for convenience called strains in this work. During the study of these cultures, all supposed to be pure, many which showed segmentations in the colonies were separated in pure culture and termed variants. Some of these reverted or fluctuated, some remained different. All were tested in connection with colony growth rate, color and spore mass production on five different agars, sporulation on malt extract agar, growth at 5, 25, 34, and 37.5° C., growth and reproduction in presence of nine different concentrations of tartaric acid, growth in presence of two concentrations of tannic acid, two of mercurochrome, five of malachite green, two of iodic acid, one of phenylacetic acid, two of sodium dinitrophenoxide, and three concentrations of sodium tribromphenate.

The tests showed decidedly different reactions, not only for different species but also for strains and variants of a given species, though many strains and some closely related species showed strikingly similar responses. "Even under controlled conditions the reaction and behavior of many organisms are extremely erratic."

**Further studies on Penicillium injury to corn,** H. JOHANN, J. R. HOLBERT, and J. G. DICKSON (*Jour. Agr. Research [U. S.], 43 (1931), No. 9, pp. 757-790, pls. 2, figs. 17*).—In this cooperative study between the University of Wisconsin and the U. S. Department of Agriculture, it was observed that the symptoms of injury following inoculation of corn seedlings with *Penicillium oxalicum* were similar in the greenhouse and field. Certain inbred strains of corn growing in the field at Bloomington, Ill., were entirely destroyed following inoculation at planting time, and yields were reduced in all cases. Wide differences in resistance were observed in inbred strains of dent corn both in the field and greenhouse. Injuries as measured by stand and yield were greater in corn grown on fertilized than on unfertilized soils.

Observations on the $F_1$ generation of crosses between (1) resistant strains, (2) susceptible strains, and (3) resistant and susceptible strains showed high resistance, high susceptibility, and high susceptibility, respectively. Corn plants from fully viable and nearly disease-free seed selected from plants not injured by cold prior to maturity were more resistant to Penicillium than was corn grown from seed of comparable viability but selected from plants killed by cold prior to maturity. In the greenhouse the most severe blighting occurred at temperatures of from 24 to 28° C.

*P. oxalicum* was not found entering vigorous living cells. A toxic substance, possibly oxalic acid, injured or killed the cells in advance of the fungus, and conditions promoting an early production and absorption of comparatively large amounts of oxalic acid favored infection. If too much oxalic acid was produced before the seedling had established a separate existence, blighting likely resulted.

It is deemed possible that low relative humidity, which increases the rate of transpiration, is more conducive to blighting than is high temperature alone.

**Breeding corn for resistance to smut (Ustilago zeae),** R. J. GARBER and K. S. QUISENBERRY (*Jour. Amer. Soc. Agron., 17 (1925), No. 3, pp. 132-140,* *fig. 1*).—Noting the contributions by Jones (E. S. R., 41, p. 747) and by Hayes et al. (E. S. R., 56, p. 241), the authors offer further data to show that the difference in smut reaction of self-fertilized corn strains is genetic in character.

"The self-fertilization of maize rapidly leads to the isolation of relatively homozygous strains. These strains differ strikingly with regard to their susceptibility to corn smut (*U. zeae*), and these differences persist throughout successive self-fertilized generations. Susceptible strains seem to show a genetic difference with regard to the place of infection on the plants."

Seed treatment and cultural practices are precluded as control measures, the production of smut-resistant varieties appearing to be the most promising method of smut control. "A direct method of accomplishing this aim is first to isolate smut-resistant strains of maize by continued self-fertilization and then to combine the resistant strains by hybridization."

**The relation of smut infection to yield in maize,** R. J. GARBER and M. M. HOOVER (*Jour. Amer. Soc. Agron., 20 (1928), No. 7, pp. 735–746; abs. in West Virginia Sta. Bul. 24 (1931), p. 52*).—The present paper presents data in continuation of the work noted above. The same general plan has been followed in the last three years as previously, except that each corn strain has been grown in duplicate rows of 50 single-stalk hills per row, and the notes have been taken three times each season, after the corn had silked, some four to six weeks later, and after the corn was husked.

Barrenness of the host caused by the smut is supposed to be the most important factor in yield reduction. Unexpectedly, the average yield of tassel-infected plants, when, in spite of such infection, barrenness was not induced, was greater than that of noninfected plants of the same genotype. This greater yield of tassel-infected plants is discussed, with recognition of the possibility of a stimulation-effect. In this calculation, lowering of quality was not included as a factor.

Both the investigation at the Minnesota Experiment Station and the more recent one herein reported show that it is possible to isolate selfed corn strains differing strikingly as regards smut resistance, also that certain strains present susceptibility in certain regions of the plant, though the cause of this has not yet been ascertained.

**Fungous diseases of the cultivated cranberry,** C. L. SHEAR, N. E. STEVENS, and H. F. BAIN (*U. S. Dept. Agr., Tech. Bul. 258 (1931), pp. 58, pls. 4, figs. 39.*)—Summing up the results of 30 years' studies, much of which has been reported on from time to time, the authors present technical descriptions, supplemented in most cases by illustrations, of 38 of the more common species of fungi occurring on the cranberry. The fungi are grouped into three divisions, (1) important rot fungi, (2) fungi causing diseases of cranberry vines, and (3) cranberry fungi of minor importance. A total of 31 other species of rather infrequent occurrence is listed.

The physiology of the rot fungi is discussed with relation to the time of infection, the manner of dissemination, acidity and temperature relations, and abundance as influenced by environment.

Control measures are given for six vine diseases caused by fungi and for various fruit rots.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**The measurement and control of atmospheric humidity in relation to entomological problems,** P. A. BUXTON (*Bul. Ent. Research, 22 (1931), No. 3, pp. 431–447, figs. 9*).—Following an introduction the author deals with methods of measurement (pp. 434–441) and methods of control of humidity (pp. 441–446).

**The thermopile for temperature determinations in entomology, W. Robinson** (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 417-423, figs. 5*).—This account includes a description of the construction of the thermopile, maintenance of the "cold junction" temperature, calibration, and the manner of applying the constant obtained by calibration.

**[Report of work in entomology at the Arkansas Station]** (*Arkansas Sta. Bul. 268 (1931), pp. 45-49*).—A brief account is given of the rice water weevil, work with which was conducted by D. Isely and H. H. Schwardt with a view to determining the extent of its injury and means for preventing it. Experimental work was conducted at the Rice Substation, the comparative yields of drained and undrained plats being reported upon in tabular form. It was found that in all the late-drained plats the yield was higher than in the nearest check plat. In the early-drained plats which were given sufficient drying, the average yield was also higher than that of the checks, although all plats were not consistent in this respect. This increase in yield might be attributed to causes other than prevention of insect damage. However, counts of larvae among the rice roots were made at approximately weekly intervals and the lower yields of the check plats were correlated with the greater abundance of larvae in these plats. The root weights of plants from the check plats were much smaller when larval feeding was heaviest.

A brief account is given by Isely of the garden webworm, scattered outbreaks of which occurred in the State in 1924, 1926, 1929, and 1931. It is pointed out that while this webworm attacks a wide range of food plants its favorite hosts in the State appeared to be pigweed (*Amaranthus* sp.) and alfalfa, infestations on cotton usually arising from one of these two hosts. Its life cycle is completed in about a month in midsummer. The pest can be easily controlled by dusting with calcium arsenate in the same manner as for the cotton worm.

In the study of horseflies by Schwardt (E. S. R., 64, p. 454) the work on the biology of *Tabanus lineola*, which included the rearing of over 200 individuals from the egg to the adult stage, was completed late in 1930. The eggs are deposited on vegetation in masses of from 300 to 450. Upon hatching out the larvae drop to the mud below into which they burrow to spend their entire larval and pupal periods. Larvae reared in the insectary required from 29 to 92 days to become full grown, 48.8 days being the average period. The pupal period required an average of 8.1 days, and the preoviposition period was 9 days. An average of 69.9 days was required for the life cycle of a generation. This species was found to have two generations a year in the northwestern part of the State, larvae from egg masses hatching as late as July 25 having produced adults before October 1 of the same year.

The lesser grain borer (*Rhizopertha dominica* Fab.), which was introduced in large numbers in imports of Australian wheat during the World War, has become of increasing importance in the United States. It has been found in Arkansas in numbers at Bentonville, Fayetteville, and Stuttgart, its greatest injury in the State being done to stored corn and rice. Observations of its life history made by Schwardt during 1931 are briefly referred to.

A study made of the life history of the eastern tent caterpillar by W. J. Baerg is briefly noted.

In work with the strawberry weevil Baerg found the most satisfactory preventive measure to consist in the growing of immune varieties, such as Aroma and Premier. Dusting with a mixture of one part of powdered lead arsenate to 3 or 4 parts of hydrated lime gave good control in 1931. While under favorable conditions a single application may be sufficient, it is considered best to repeat it after five or six days.

**[Report of the department of entomology],** L. A. Stearns and L. L. Williams (*Delaware Sta. Bul. 172 (1931), pp. 30-36*).—In reporting upon the codling moth, of which there was a tremendous increase in 1930, it is stated that the spray program was totally inadequate in the most seriously infested area. A campaign that was commenced to prevent repetition of the losses, in addition to spraying and supplementary measures (scraping and banding of trees, disposal of infested drop and cull apples, and housing of infested containers) included the organization of community effort in the application of such control measures. Notwithstanding this effort, survival from hibernation was high, resulting in an overwintered population unquestionably in excess of that for a normal season. Bait pan collections at Camden and Bridgeville indicated two distinct periods of moth activity, the first immediately following the peak of emergence in the orchard (May 22 to June 6) and the second subsequent to the maximum emergence from packing houses (June 19 to 26). The apple spray program had been thoroughly revamped, and the immediate results of the campaign were indicated by the fact that the first brood in 1931 at its peak caused generally less injury than did that of 1930, the early season infestation being almost directly proportionate with the effort of individual growers in applying the control measures recommended.

Work with the grape leafhopper, which appeared in almost unprecedented numbers in 1930, indicated that 40 per cent nicotine sulfate, when included in the last or 10-day spray of the grape spray program, was applied too early to secure most effective control. An experimental spray of 40 per cent nicotine sulfate at the 1 to 800 dilution with Penetrol, 1 to 200, applied with 250 lbs. pressure from both sides of the row, with a 4-ft. rod containing three nozzles directed upward, gave practically 100 per cent kill. The recommended spray of Bordeaux, 6-12-100, dry arsenate of lead, 4 lbs. to 100, fish oil, 1 pint to 100, and 40 per cent nicotine sulfate, 1 to 800, effected likewise substantial decreases in population varying from 50 to 75 per cent.

In seasonal life history work with the plum curculio in 1930 it was found that certain curculio from southern Delaware are apparently capable of developing a second brood at all points in the State, while those from central and northern Delaware produce only a single brood when reared under identical conditions. The existence of one- and two-brooded strains of this insect is indicated. In referring to the rather general decrease in the population of the curculio in the southern part of the State in 1931 as compared with 1930, it is pointed out that in addition to crop failure of the preferred host and the effect of heat and severe drought the common parasite *Triaspis curculionis* Fitch is effecting an appreciable and increasing reduction in the numbers of the pest.

In referring to the work with the grape berry moth it is pointed out that the two complete broods and a partial third brood developing in the State each year overlap sufficiently to provide, if unchecked, a continuous and progressive increase in infestation throughout the season. Vineyard sanitation is the most important consideration in its control, and in conjunction with thorough and timely spraying with proper equipment should adequately curb its activities under average conditions of infestation. The 10-day, preblossom, and postblossom applications of the recommended grape spray program, including Bordeaux, 6-12-100, and lead arsenate at the rate of 4 lbs. and fish oil at the rate of 4 oz. by weight to each pound of insoluble material per 100 gal. of water, in the succession named, have been found to be the most effective sprays in grape berry moth control.

Due to unfavorable conditions during the winter a high mortality of the oriental fruit moth occurred and the spring brood in 1930 was of moderate proportions. Parasitism of the twig-infested first and second broods of larvae amounted to 17 and 84 per cent. respectively, with *Macrocentrus ancylivora* Roh. and *M. delicatus* Cress. the principal species concerned.

**Florida truck and garden insects,** J. R. Watson (*Florida Sta. Bul. 232 (1931), pp. 112, figs. 59*).—This is a revision of Bulletin 151 (E. S. R., 41, p. 455).

**[Work with economic insects at the New York State Station]** (*New York State Sta. Rpt. 1931, pp. 49–71, fig. 1*).—In further studies of economic insects (E. S. R., 64, p. 455) it was found in work with new insecticides for the control of the codling moth that summer oils used alone are not equal in effectiveness to arsenate of lead. They may, however, prove of value as a substitute for the last summer application of an arsenical since they do not increase the arsenical deposit on the fruit and are effective for a time as ovicides. It is pointed out that the addition of nicotine sulfate increased the efficiency of oil sprays, and the combination of lead arsenate and oil makes an effective treatment for the codling moth. Repeated tests have shown that when more than two applications of summer oils are made there is considerable danger of russeting of apples.

Work with the fruit tree leaf roller over a period of years has shown that too much dependence should not be placed on the arsenical sprays, due to unfavorable climatic conditions that may appear. Not all oils have been found equally efficient, and the various tar washes after 3 years of trial have proved to be of little value for this pest. The application of arsenicals for the codling moth has been found to be valuable in reducing injury by the red banded leaf roller (*Eulia velutinana* Walk.), a pest that is on the increase, the late summer feeding of the larvae on the fruit being noticeable in many orchards.

Tar washes proved very effective as ovicides in combating the rosy apple aphid, although injury in some instances was caused to fruit buds.

A study of the leafhoppers has shown that injury to orchards in western New York is largely due to *Typhlocyba pomaria* McAtee and *Empoasca fabae* Harr. While the apple leafhopper is also common, its injury is usually unimportant. The nymphs of *T. pomaria* are practically all hatched by the calyx period and are easily killed at that time with a nicotine spray. Dormant treatments with 6 per cent lubricating oil emulsions and tar washes in an attempt to kill the overwintering eggs proved ineffective. The nymphs of *E. fabae* were readily killed with contact insecticides such as nicotine and pyrethrum sprays applied before the leaves curl. The most striking results, however, were obtained with Bordeaux mixture, the nymphs having been killed, even in the curled leaves, when the foliage was coated with this material.

It was found in work on the reactions of the eye-spotted bud moth, fruit tree leaf roller, and codling moth to light in the orchard under natural conditions that thousands of bud moths and leaf rollers but comparatively few codling moths were attracted at night. In an intensive study of the physiology and histology of the eyes of the codling moth and the relation between various conditions of the eyes and the daily and nightly activity of the moths, the diurnal and nocturnal conditions of the eye are clearly differentiated by the position of the distal pigment granules, which move in and out under the influence of changing light intensity. The codling moth was found to be most active during periods of morning and evening twilight, at which times the distal pigment is in the process of migration from one position to the other. It was discovered in the laboratory work that codling moths respond to the light stimulus most quickly and most certainly after they have been completely dark adapted. Since in the natural state they do not become dark adapted until sundown and are not attracted to lights until after it is dark, it is indicated that at least a partial dark adaptation is necessary before a definite response to artificial light takes place.

It was found that the raspberry fruit worm can be held in check by properly timed arsenical sprays. Orchard work has shown that under ordinary conditions the amount of arsenic in fruit fly sprays can be greatly reduced without seriously affecting the degree of control.

Work with the cabbage maggot demonstrated that injury to kraut cabbage seedlings by the cabbage maggot can be greatly reduced by the use of naphthalene, from three to five applications ordinarily giving a marked degree of control.

The black vine weevil (*Brachyrhinus sulcatus*) and the strawberry root weevil (*B. ovatus*) have appeared in several localities as strawberry pests and been particularly destructive to such plants as spiraea, yew, and hemlock.

In work with the pear psylla (E. S. R., 64, pp. 855, 856), cluster-bud applications of lime-sulfur 1 to 8 and of lime-sulfur 1 to 8 with the addition of 1 pint of nicotine sulfate to each 100 gal. of mixture were found to control psylla during the spring, the latter formula being somewhat more effective than the former.

In combating the pear midge (E. S. R., 65, p. 56), nicotine sprays were found very effective against the adults. About equally good results were secured regardless of whether 1 pint of nicotine was added to any one of the following spray mixtures: Lime-sulfur 1 to 11 or 1 to 40, Bordeaux (2–10–100), summer oil emulsion 2 per cent, or fish-oil soap 3 lbs. in 100 gal. of water. Proper timing of the applications is said to be the most important point to be emphasized in pear midge control.

Field work conducted in 1930 indicated that the quince curculio can be controlled by arsenate of lead, provided the applications are properly timed. A pear leaf curling midge which appears to be *Cecidomyia pyri* was discovered during June, 1930, in three neighboring localities in Ulster County.

In the study of tar distillate sprays that has been in progress 3 years, their efficiency was high at the dilutions tested on apple aphid eggs, pear psylla eggs and adults, and on the spruce gall aphid. A good control of the bud moth at 8 per cent was also secured.

Work with the oriental fruit moth (E. S. R., 65, p. 55) is reported upon.

The green peach aphid and the onion thrips were the most injurious pests of cauliflower seed beds in 1930, the use of an additional cover spray of Kayso with an arsenical being the most effective means of preventing their reinfestation.

Work with the apple maggot (E. S. R., 64, p. 57), including the location of traps in the investigations in the Hudson River valley in 1930, is reported upon. The apple curculio is said to have badly damaged some orchards in the Champlain Valley in 1930.

**[Report of the department of entomology]** (*Virginia Sta. Rpt. 1928–1931, pp. 34–39, fig. 1*).—In briefly reviewing entomological work during the 4-year period ended June 30, 1931, it is pointed out that the results obtained in a study of the resistance of the codling moth indicate that tolerance of strains of the pest to spray materials is not specific for arsenic but occurs with such insecticides as creolite, barium fluosilicate, and rotenone. In spraying for the control of the codling moth and leaf roller it was found that by applying a larger volume of spray material at a pressure of 350 lbs. the leaves on the trees were turned sufficiently to cover both sides with the material.

In control work with the oriental fruit moth aimed at destroying the cocooned larvae on the trunk by application of a contact insecticide, it was found that sprays or washes containing paradichlorobenzene dissolved in kerosene and carbon disulfide or kerosene alone are fatal to the larvae after they have finished feeding and spun their cocoons. The egg parasite *Trichogramma minutum* was reared and released in several peach orchards in the State, observations indicating that they continued to live and multiply in the orchard.

Four species of leafhoppers were found to be injurious to foliage of the apple tree, the rose leafhopper (*Typhlocyba pomaria*) being generally present and causing the most damage. This species hibernates on the apple tree in the egg stage, the eggs being found on one- or two-year-old wood. The eggs hatch in May and June and both nymphs and adults feed on the foliage, the first brood of adults disappearing about July. The second brood of nymphs and adults occurs during the latter part of August and September and causes the severe spotting of the leaves and fruit.

Reference is made to a study of spray russeting due to arsenic. Substitutes for lime-sulfur which are known to reduce spray injury somewhat include sulfur-lime, dry-mix, calcium sulfide, and three flotation sulfurs.

In control work with several species of aphids injurious to apple trees conducted at the Winchester field laboratory, tar distillates were used by W. S. Hough in dormant spraying with excellent results as ovicides. Combinations of oil emulsions alone and with nicotine sulfate and Derris applied as a late dormant spray demonstrated clearly the advantage of nicotine sulfate as an aphicide.

A study was made by G. W. Underhill of the life history of the green stink bug, which is often troublesome and sometimes causes severe injury to fruit and vegetables. It was found to feed on the tender twigs of forest trees early in the season and later upon the seed pods of locust, migrating from plant to plant as the season advances. It has been an important pest at times in peach orchards and has inflicted severe damage in fields of Lima beans. The spores of the yeast spot disease are injected by the adults and nymphs in feeding and cause the pods of the beans to wilt and fall off.

In the study of the plum curculio by A. M. Woodside it was found that the adults continue to migrate to the peach orchard from woods for as long as 2 or 3 weeks. During this period they may be found in greatest abundance on the trees nearest the woods.

**[Report of work with economic insects by the West Virginia Station]** (*West Virginia Sta. Bul. 244* (*1931*), *pp. 36–39*).—In reporting upon work by E. Gould and L. M. Peairs with the pistol case bearer, it is said to have developed within the past few years into a pest of first order in certain orchards in the eastern section of West Virginia. In control work the use of nicotine was found effective, its efficiency being increased and the cost lowered when Penetrol was added.

In work with the codling moth, by Peairs, the best results were obtained in the search for a substitute for arsenate of lead from the use of magnesium arsenate, although satisfactory control was obtained from the use of fluosilicates.

In control work with the Mexican bean beetle it was found by Peairs that pyrethrum extract, particularly Red Arrow alone or with Penetrol, quickly reduced heavy infestations of the larvae where early spraying with other materials had been neglected. The pyrethrum extract also has a decided killing effect on eggs, pupae, and adults.

It was found by Peairs and Gould that apple aphids, mainly the green aphids, can be killed in the early season with dilutions of nicotine as great as 1 part to 4,000 parts of water if Penetrol at 0.5 strength is added. Midsummer tests at Morgantown gave from 95 to 100 per cent kill with 1 part nicotine to 6,000 parts of water and from 85 to 95 per cent with 7,500 parts of water. Other tests showed similar kill with 4,000 parts of water and 0.75 per cent Penetrol. Penetrol alone showed little kill. Strengths less than 1 to 4,000 were ineffective in spring but effective in late June at temperatures of from 75 to 90° F. during the period of the tests, indicating that the critical dilution depends somewhat on temperature. Kill of wholly dormant eggs has been strongly indicated with a pyrethrum-white oil combination. Kill of active forms with very dilute solutions of nicotine-Penetrol was secured. With pyrethrum-white oil-Penetrol mixtures even greater dilutions (1 to 5,000) were effective in a few cases. An accurate measure, however. of the strength of pyrethrum extract was not available.

In a study of temperature in relation to insect life, by Peairs, it was found that for those contact insecticides whose action is purely corrosive, such as nicotine extracts and pyrethrum extracts, the killing power seems to be but little affected by variations in temperature above the freezing point of the liquid used.

Two tests made by Peairs with poisoned potatoes as bait in the soil for mole crickets indicate that the pest will eat and be killed by potatoes poisoned with arsenic and probably by those poisoned with strychnine, although they appear to avoid the strychnine, preferring the unpoisoned potatoes where available.

In control work with the squash vine borer four applications of a nicotine-lead arsenate spray to the lower portions of the stems of the vines from 5 to 7 days apart gave good control. Control of the cucumber beetle was obtained by spraying the entire plant twice with Bordeaux mixture and lead arsenate. once while it was still bushy and once after it had started to run freely. In gardens in one locality the giant ragweed was found to harbor 85 per cent of the common stalk borer. The destruction of this plant late in June. and burning or feeding it to hogs to eliminate survival of the larvae, is recommended. Magnesium arsenate, with dust or liquid carrier, proved the best means of control for blister beetles. The stronger grades of calcium cyanide were found unsafe for dusting the foliage of most truck crops.

**Pyrethrum flowers: A quantitative study of their development, F. Tattersfield** (*Ann. Appl. Biol., 18 (1931), No. 4, pp. 602–635, pl. 1, figs. 9*).—Included in this contribution from the Rothamsted Experimental Station is an account of the percentage of pyrethrin, the content per flower head, the content of flowers in different stages of maturity taken at the same time, and the content per plant. The experimental data indicate that there is a quantitative development of the active principles in the flower heads from the small bud stage up to the time of maturity of the flowers which more than keeps pace on the whole with the increase in weight of the flowers. The mean percentage content of pyrethrins was found to fall after pollination and the fading of the flowers.

**Parasites and hyperparasites of the egg-pods of injurious locusts (Acridodea) of Turkestan, A. A. Jazykov (Zakhvatkin)** (*Bul. Ent. Research, 22 (1931), No. 3, pp. 385–391*).—A list is first given of the parasites of the egg pods of 9 species of locusts of economic importance in Turkestan. This is followed by a summary of biological data obtained on 21 species of parasites reared.

**The biology of Thysanoptera with reference to the cotton plant.—VII, The relation between temperature and humidity and the life cycle, E. I. Mac Gill** (*Ann. Appl. Biol., 18 (1931), No. 4, pp. 754–583, figs. 3*).—This contribution is in continuation of those previously noted (E. S. R., 64, p. 544).

**The relation of temperature and rainfall to outbreaks of the grape leafhopper, Erythroneura comes Say,** J. R. Eyer (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 238–259. figs. 17*).—The author deals with the subject under the headings of (1) a survey of literature on grape leafhopper outbreaks, with particular reference to those occurring in the Lake Erie region of the United States, (2) definition and climatological characteristics of the Lake Erie region, (3) seasonal history of the grape leafhopper with relation to normal weather variations, (4) seasonal life history of the grape leafhopper, with particular relation to temperature and rainfall during the period 1920–1925, and (5) a comparison of the weather conditions described as influencing leafhopper populations of 1920–1925 with those of other outbreaks.

**Studies on the biology of Paratrioza cockerelli (Sulc.),** G. F. Knowlton and M. J. Janes (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 283–290, pl. 1*).—This contribution from the Utah Experiment Station reports on observations of the life history and habits of the potato psyllid *P. cockerelli* and its occurrence in the field.

**Ecology of Toxoptera graminum, especially as to factors affecting importance in the northern United States,** F. M. Wadley (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 325–395, figs. 22*).—The first part of this contribution reports upon a study of the ecology of the green bug (pp. 327–374) and the second part on the factors affecting distribution, especially as to northern outbreaks (pp. 374–390). A list of 71 references to the literature cited is included.

**Further studies on leaf-curl of cotton in the Sudan,** T. W. Kirkpatrick (*Bul. Ent. Research, 22 (1931), No. 3, pp. 323–363, pls. 2, fig. 1*).—Following a brief review of literature regarding leaf curl, details are given of experimental work relating to its transmission by insects. In the attempted transmission of infection from Sakel cotton to Sakel by means of white flies of the species *Bemisia gossypiperda* Misra and Lamba, 157 of 168 attempts gave positive results. It was found that a single white fly can transmit the disease to a healthy plant, though infection is less regularly obtained when one or only a few white flies are used. It was found that the infection could be transmitted by white flies from Sakel cotton to bamia (*Hibiscus esculentus* L.) to til (*H. cannabinus* L.) and to karkade (*H. sabdariffa* L.). It has also been observed on garden hollyhocks. Negative results were obtained in transmission work with other insects.

**The magnolia scale (Neolecanium cornuparvum Thro.),** G. W. Herrick (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 302–304, pl. 1*).—A brief account of this pest.

**Control of hibernating caterpillars of the eye-spotted budmoth in apple orchards,** S. W. Harman (*New York State Sta. Bul. 600 (1931), pp. 18, figs. 5*).—The author reports upon studies of the hibernating caterpillars of the eye-spotted budmoth, with particular reference to their habits during the spring as well as to their susceptibility to insecticides prior to their entrance into apple buds and during the period of their occupancy of blossom and leaf clusters.

It was found that the movement of the caterpillars from their winter shelters to apple buds is stimulated by temperatures above 60° F. Continuous warm weather accelerates their activity, limiting the invasion of the buds to a relatively short period. Fluctuations between low and high temperatures tend to prolong the period of migration, thus lengthening the time during which the infestation of the buds occurs. Failure to control the pest by standard spray practices may be explained largely on the basis that treatments have usually been made without reference to the spring activities of the caterpillars and to the extreme difficulty of securing effective results from arsenicals by reason of the habit of the caterpillars in securing subsistence from within the buds or within webbed blossom and leaf structures.

Of the materials tested, namely, arsenicals, oils, and nicotine preparations, the latter proved the most effective. Lead arsenate used in all applications prior to and including the preblossom spray did not afford commercial protection. Certain oil sprays used alone were equally inefficient. Nicotine sprays exerted a lethal action on the caterpillars within the winter shelters and also proved destructive to caterpillars occupying exposed positions during the course of their migration from the winter shelters to the buds. In case of heavy infestations 1 qt. of nicotine sulfate to 100 gal. of spray mixture was more effective than 1 pint. Maximum destruction of the caterpillars was secured by applying the spray just before their migration from the winter shelters to the buds. The treatment at this period may be designated as the "green tip" application.

The delayed dormant treatment, while less effective under some circumstances, proved to be of considerable supplementary value to the green tip spray. It merits consideration during seasons when the weather prevents making a green tip application or during those seasons when, on account of temperature fluctuations, the period of migration of the caterpillars from the winter shelters to the buds is prolonged.

**A list of cochlidionid moths in Japan, with descriptions of two new genera and six new species**, A. Kawada (*Jour. Imp. Agr. Expt. Sta., Nishigahara, Tokyo, Japan, 1 (1930), No. 3, pp. 231–262, pl. 1, figs. 21*).—The author recognizes 27 genera and 62 species of cochlidionid moths in Japan, of which 2 genera are erected and 6 species are described as new. The slug caterpillars are said to be extensively distributed from Hokkaido in the north to Formosa (Taiwan) in the south, devouring many horticultural plants. Among the species is a serious pest, the oriental moth, hitherto unrecorded from Formosa. It was found that the majority of slug caterpillars are highly polyphagous in character and cause a great deal of damage in the tropics and subtropics to farm and fruit plants, such as cherries, pears, oranges, tea, coffee, and others.

**Resistance of varieties of winter wheat to Hessian fly, Phytophaga destructor (Say)**, R. H. Painter, S. C. Salmon, and J. H. Parker (*Kansas Sta. Tech. Bul. 27 (1931), pp. 58, figs. 7*).—A historical statement and discussion of the methods employed and of the measuring of the differential infestations of varieties are followed by a report of experimental work with the Hessian fly from the hard wheat belt, including infestation of varieties, descriptions of important varieties, relation between fly resistance and other characters, inheritance of resistance in crosses of resistant by susceptible varieties, and greenhouse tests of $F_1$ plants. The kinds of resistance are next considered, followed by a report upon the biological strains of the Hessian fly, including uniform fly nurseries in the field, uniform greenhouse tests, soil tests, selective breeding of strains of the fly, possible mode of origin of biological strains, and a summary of evidence on biological strains.

The percentage of tillers infested, coupled with the rank of a variety in a single experiment or set of experiments, is said to constitute probably the best measure of resistance. Under special conditions, estimations, percentage of plants infested, or number of flaxseed and larvae present may be used to advantage.

Evidence is presented which indicates that varieties may be pure or homozygous so far as agronomic characters are concerned and impure or heterozygous for fly resistance factors. Resistance to fly of the hard wheat belt is found in a marked degree in Fulhard, a hard wheat, and in the semihard variety Kawvale, as well as among the soft wheats. In the isolation of Kawvale and Fulhard by pedigree selection considerable progress has been made toward the ultimate object of this investigation; that is, the production of wheat varieties adapted to Kansas which will be equal or superior in agronomic characters to those now grown, and in addition will be resistant to Hessian fly. Suggestions are made concerning five characteristics which affect the resistant qualities of wheat varieties. These are (1) a decided difference in the number of flies which develop on the several varieties; (2) a kind of tolerance as found in Blackhull wheat, permitting fly to develop without material damage to the plant; (3) the ability of some varieties of wheat to develop fly better and faster than other varieties; (4) the ability of wheat to produce tillers after infestation; and (5) the stiffness of straw in relation to Hessian fly damage.

**A method for locating the larvae of the mosquito Mansonia,** T. E. McNeel (*Science, 74 (1931), No. 1910, p. 155*).—The author describes the method which he employed in locating larvae of mosquitoes of the genus Mansonia, which differ from other mosquitoes in that, with the exception of the first few days of larval life, the larval and pupal periods are spent at the bottom of the ponds and marshes where they breed. Peculiar adaptations of the larval air tube and of the pupal breathing trumpets enable them to pierce submerged roots and stems of plants and obtain air therefrom.

**The biology of Tabanus lineola Fabr.,** H. H. Schwardt (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 409–416*).—In studies conducted in Arkansas, the author found that at least two generations of *T. lineola* occur each year.

**A new species of warble-fly (Diptera—family Tachinidae, subfamily Hypoderminae, genus Hypoderma), which attacks goats in Cyprus,** E. E. Austen (*Bul. Ent. Research, 22 (1931), No. 3, pp. 423–429, figs. 5*).—Under the name *Hypoderma aeratum* the author describes a new species, the larvae of which were reared from warbles on a kid and a goat in Cyprus.

**Notes on the biology of the stable-fly, Stomoxys calcitrans Linn.,** R. Melvin (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 436–438*).—The author's observations of the stable fly reported upon have led to the following conclusions: "Incubation period of *S. calcitrans* at 25° C. is 33.1 hours; at 30°, 26.5 hours. Larval and pupal period of *S. calcitrans* bred on alfalfa meal and wheat bran half and half by weight at 25° was 377 hours; at 30°, 311.7. Larval and pupal period of *S. calcitrans* bred on ground oats at 30° was 320.2 hours in one series of tests and 326.1 hours in another series of tests. Pupal period of *S. calcitrans* at 100 per cent relative humidity was 177.2 hours. Only 10 per cent adults were obtained from pupa placed over a saturated solution of sodium chloride, approximately 73 per cent relative humidity at 25°."

**The blueberry maggot from an ecological viewpoint,** F. H. Lathrop and C. B. Nickels (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 260–281, pls. 4, figs. 3*).—This contribution deals with the subject under the headings of climate and topography; the process of burning over the blueberry land; the reaction of the blueberry plant to burning; the effect of burning upon the blueberry maggot; the blueberry maggot in relation to plant succession; some host plant relationships; and apple, haw, blueberry relationships.

**Carabid beetles as strawberry pests in the Cheddar district,** C. L. Walton and H. G. H. Kearns (*Jour. Min. Agr.* [*Gt. Brit.*], *38 (1931), No. 4, pp. 373–379, pls. 4*).—Four species of ground beetles, including the strawberry seed beetle (*Ophonus pubescens* Ml.), *Pterostichus madidus* F., *Abax ater* Vill., and *P. vulgaris* L., have proved to be the cause of injuries to ripening strawberries at Cheddar and elsewhere. The first mentioned is responsible for the worst type of damage, namely, the removal and ingestion of the seed contents, thereby ruining the fruit; the other species either cause less marked injuries or gnaw holes in the fruit. These various types of damage were produced under controlled conditions. A brief account of the life histories and habits of these species is included.

**Ptilineurus marmoratus Reitter, an anobiid beetle noxious to the rush mat, with description of a new parasitic bethylid fly** [trans. title], H. YUASA and T. OSOU (*Jour. Imp. Agr. Expt. Sta., Nishigahara, Tokyo, Japan, 1 (1930), No. 3, pp. 215–230, pls. 5; Eng. abs., pp. 229, 230*).—This is a brief account of the anobiid beetle *P. marmoratus*, which was a source of serious injury during the summer of 1929 through devouring Japanese rush mats. This beetle is now found spread over the main island of Japan (Honshu). It has been recorded from the Dutch East Indies and from the United States, where it is said to have been introduced from Japan.

**New injurious Curculionidae (Col.)**, G. A. K. MARSHALL (*Bul. Ent. Research, 22 (1931), No. 3, pp. 417–421, pl. 1*).—*Aedophronus echinatus*, feeding on the young shoots of newly planted almond trees in the Transvaal; *Mimaulus sulcatifrons*, feeding on tobacco leaves and destroying the seedlings in the Transvaal; *Lalagetes leurops*, the adults of which were found feeding on grapevines in the Cape of Good Hope; *Diaphna nociva*, seriously injuring pine trees by boring under the bark and partly into the wood in the Cape of Good Hope; and *Catoptes instabilis* and *C. fraudator* on turnips in New Zealand, are described as new.

**The Sphegidae of South Africa, XV**, G. ARNOLD (*Ann. Transvaal Mus., 14 (1931), No. 2, pp. 135–220, figs. 51*).—This is the concluding part of the account previously noted (E. S. R., 62, p. 861).

**Macrocentrus ancylivora Rohr. and M. delicatus Cress. distinct species**, B. F. DRIGGERS and B. B. PEPPER (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 293–301, figs. 4*).—This is a contribution from the New Jersey Experiment Stations on the parasite *M. ancylivora*, which was first reared and described in 1923 from the strawberry leaf roller and later from larvae of the oriental fruit moth, and on *M. delicatus*, first observed in 1927 by Peterson and Haeussler, also parasitizing larvae of the oriental fruit moth in New Jersey. An introductory account is followed by a discussion of methods, life history notes in 1929 and 1930, report of attempts to crossbreed the two species, and morphological differences. The studies seem to prove that *M. ancylivora* and *M. delicatus* are two distinct species parasitizing the larvae of the oriental fruit moth.

**Importance of the sex ratio in oriental fruit moth parasite breeding**, P. GARMAN and J. C. SCHREAD (*Ann. Ent. Soc. Amer., 24 (1931), No. 2, pp. 424–426*).—In work at the Connecticut State Experiment Station the authors have found that the ratio of males and females is easily variable, it being affected strongly by refrigeration in the case of *Trichogramma minutum* and possibly by several factors for *Macrocentrus ancylivora* Roh. The percentage of male Trichogramma emerging after 12 days' refrigeration was 25 per cent, whereas the percentage was 75 after 50 days. In the case of Macrocentrus, the percentage of males varied all the way from 41 per cent in material imported from New Jersey to 69 per cent in parasites reared in September under greenhouse conditions.

**The life cycles of Trichogramma minutum in relation to temperature**, S. E. FLANDERS (*Science, 73 (1931), No. 1895, p. 458*).—The author calls attention to the fact that this egg parasite is ideal for use in experimental work, since the amount of food available is the only limiting factor in its production. It can be reared at the rate of 52 generations a year, the period of continuous development ranging from as short as 6 days to as long as 80 days.

**Four new species of Ichneumonoidea**, D. S. Wilkinson (*Bul. Ent. Research, 22 (1931), No. 3, pp. 393–397, pl. 1*).—*Glypta leucotretae*, reared from the false codling moth (*Argyroploce leucotreta* Meyr.) in Southern Rhodesia; *Mesobracon psolopterus*, from the coffee branch borer in Sierra Leone; *Camptothlipsis furtifica*, reared from larvae of the tineid (gelechiid) moth *Dichomeris eridantis*, defoliating *Dalbergia sissoo* in the Punjab; and *C. antigastrae*, parasitic on the cosmopolitan pyralid moth *Antigastra catalaunalis* Dup. in the Anglo-Egyptian Sudan, are described as new.

**The life history of Babesia bigemina in the North American fever tick**, E. W. Dennis (*Science, 73 (1931), No. 1901, pp. 620, 621*).—This is a report of studies of the sexual phenomena and sporogony of *B. bigemina* which take place in the cattle tick.

**The cultivation of a nematode parasite of an insect**, R. W. Glaser (*Science, 73 (1931), No. 1901, pp. 614, 615*).—In continuation of the study of the nematode parasite of the Japanese beetle (E. S. R., 62, p. 861), described by Steiner as *Neoaplectana glaseri* (E. S. R., 62, p. 861), the author reports upon its cultivation on artificial media, this being the first time that the entire life cycle of a parasitic nematode has been obtained on an artificial medium. The cultivation was accomplished through transfers being made every 10 days to 2 weeks on standard meat infusion agar plates containing 1 per cent dextrose and having a reaction of pH 7.4. At the end of 6 months the nematode failed to reproduce and the majority died.

It is pointed out that the cultivation of this form makes it possible to propagate the species in large numbers, and it may prove to be of value in combating the Japanese beetle.

## ANIMAL PRODUCTION

**Home-grown feeding stuffs**, H. E. Woodman (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 18 (1930), pp. IX+23*).—In this bulletin the author has indicated how feeding stuffs grown on the farm may be used advantageously in the feeding of livestock for the production of meat, milk, and wool.

**Ensilage**, A. Amos and H. E. Woodman (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 37 (1931), pp. V+50, fig. 1*).—This is a revised edition of a publication previously noted (E. S. R., 57, p. 661).

**Silage**, D. W. May (*Porto Rico Sta. Rpt. 1930, p. 49*).—In silage studies with various crops it was found that corn made the best product, with cane second. Trouble was experienced with the latter crop because of the excessive fermentation of its high sugar content. Even with cane tops fermentation was difficult to control when too much moisture was present, but did not occur at all when the tops were too dry. The grasses, malojillo, elephant grass, and Guatemala grass, made poor silage because they were too light to pack readily and lacked sufficient juice to ferment well. Velvetbeans made a black and unsavory silage. Cattle differed in their liking for silage, and with green forage usually available throughout the year the value of this feed at the station was doubtful. Corn silage was carried over a period of 2 years with good results.

**Handbook on the feeding and nutrition of agricultural animals, III**, edited by E. Mangold (*Handbuch der Ernährung und des Stoffwechsels der Landwirtschaftlichen Nutztiere als Grundlagen der Fütterungslehre. Berlin: Julius Springer, 1931, vol. 3, pp. XI+674, figs. 145*).—In the third volume of this treatise (E. S. R., 64, p. 463) the metabolic processes of animals are described, together with sections on the feeding, digestion, and metabolism of bees and fishes.

**[Animal husbandry investigations at the Canadian experimental stations and farms]** (*Canada Expt. Farms, Rpts. Supts. 1930, Agassiz (B. C.) Farm, pp.*

*4–6, 7–19, 57–61, figs. 5; Cap Rouge (Que.) Sta., pp. 3–16, 43–48, figs. 4; Farnham (Que.) Sta., pp. 23, 24; Fredericton (N. B.) Sta., pp. 4–13, 61–65; Indian Head (Sask.) Farm, pp. 6–14, 49–52, figs. 2; Kapuskasing (Ont.) Sta., pp. 4–11, 47–53, figs. 2; Lacombe (Alta.) Sta., pp. 11–36, 48–56, figs. 6; Lennoxville (Que.) Sta., pp. 6–19, 60–68, figs. 3; Morden (Man.) Sta., pp. 4–10, 69–76, figs. 2; Nappan (N. S.) Farm, pp. 4–23, 54–64, fig. 1; Rosthern (Sask.) Sta., pp. 4–26, 52–63, fig. 1; Scott (Sask.) Sta., pp. 6–15, 64–68, figs. 2; Sidney (B. C.) Sta., pp. 4–9, 54–66, figs. 2; Summerland (B. C.) Sta., pp. 71–79, fig. 1).*—In these publications (E. S. R., 65, p. 60) brief reports are given by W. H. Hicks, G. A. Langelier, R. Bordeleau, C. F. Bailey, W. H. Gibson, S. Ballantyne, F. H. Reed, J. A. McClary, W. R. Leslie, W. W. Baird, W. A. Munro, G. D. Matthews, E. M. Straight, and W. T. Hunter, respectively, on the results of feeding and breeding experiments with horses, beef and dairy cattle, sheep, swine, and poultry.

**Influence of desiccated thyroid and iodine on growth.—II, With a standard acid diet, F. E. Chidester and W. M. Insko, jr.** (*Amer. Nat., 63 (1929), No. 686, pp. 239–247, figs. 3; abs. in West Virginia Sta. Bul. 244 (1931), p. 51*).—Continuing this study (E. S. R., 63, p. 760), 28 rats and 6 rabbits were used to determine the influence on growth of thyroid extract and iodine with a standard acid diet. Glucose apparently protected rabbits somewhat from the usual iodine effects. Low dosage of thyroid favored pregnancies with rabbits and did not cause resorption of young. Minute doses of thyroid induced growth of bones and increased weight, and glucose administered with iodine accelerated this gain.

**Influence of arsenic, ferrous sulphate, and copper sulphate on rats furnished a vitamin A-free diet with iron added, F. E. Chidester and A. G. Eaton** (*Soc. Expt. Biol. and Med. Proc., 26 (1928), No. 2, pp. 141, 142, fig. 1; abs. in West Virginia Sta. Bul. 244 (1931), p. 53*).—Minute doses of arsenic, ferrous sulfate, and copper were found to be less effective in vitamin A deficiency than a combination of iron and iodine.

**Influence of modified Fowler's solution of arsenic on rats receiving vitamin A-free diet with iron iodide added, F. E. Chidester, A. G. Eaton, and G. P. Thompson** (*Soc. Expt. Biol. and Med. Proc., 26 (1928), No. 2, pp. 143, 144, fig. 1; abs. in West Virginia Sta. Bul. 244 (1931), p. 53*).—Vitamin A deficient rats were fed Fowler's solution of arsenic in doses of 0.379 mg. daily in combination with iodide of iron. The rapid loss in body weight which occurred indicated probable digestive disturbances due to arsenic in the presence of iron.

**Supplemental concentrated feeds for cattle on bluegrass pasture** (*Virginia Sta. Rpt. 1928–1931, p. 46*).—The additional gains produced by supplementing bluegrass pasture with cottonseed meal and corn for steers and spayed heifers were not sufficient to pay for the supplemental feed as compared with the gains obtained on grass alone during the dry summer of 1930.

**[Beef cattle studies in West Virginia]** (*West Virginia Sta. Bul. 244 (1931), pp. 11, 13*).—The results of two studies are noted.

*Feed has no appreciable effect on color of beef.*—Spectrophotometric color determinations by J. H. Longwell on samples of beef from approximately 100 experimental cattle that had received various feeds such as pasture alone, pasture and grain, and pasture alone followed by grain and hay showed no evidence of difference in color between grass-finished and grain-fed beef of comparable finish.

*Good West Virginia calves make choice baby beef.*—Spring calves purchased late in the fall and fed for 200 days by E. A. Livesay on a ration of corn, oats, linseed meal, cottonseed meal, corn silage, and mixed hay weighed approximately 900 lbs. at marketing time and were considered choice baby beeves. Over the 6 years of the study each calf returned an average of $54.64.

**From wheat to meat,** J. H. SHEPPERD (*North Dakota Sta. Circ. 45 (1931), pp. 8, figs. 6*).—The change in the Red River Valley from a wheat raising to a cattle producing area is described in this publication.

**Sheep husbandry in Tadzhikistan,** S. G. AZAROV and O. I. BRIGIS (*Ovtsevodstvo Tadzhikistana. Moscow: Narod. Komis, Zeml. Tadzhik. S. S. R., 1930, pp. 206, pl. 1, figs. 115*).—In this monograph, a report of the Moscow Zootechnic Institute's expedition during 1927–28, the authors describe the natural and economic conditions of Tajikistan, with special reference to sheep husbandry, together with a description of the history, characteristics, and special qualities of the breeds of sheep native to the country.

**Bibliography on the biology of the fleece** (*Edinburgh: Imp. Bur. Anim. Genet., 1931, pp. 32*).—A bibliography prepared by the Imperial Bureau of Animal Genetics, Edinburgh, Scotland, dealing with the biological aspects of the study of the fleece of sheep.

**Breed of sire as a factor in lamb production** (*West Virginia Sta. Bul. 244 (1931), p. 15*).—C. V. Wilson and E. A. Livesay in cooperation with the U. S. D. A. Bureau of Animal Industry found that over a 4-year period single lambs sired by Southdown, Shropshire, and Cheviot rams and out of grade Hampshire ewes had an average birth weight of 9.5 lbs., while lambs by Hampshire rams averaged 10.3 lbs. Single lambs by each of the breeds were about 2 lbs. heavier at birth than twin lambs by the same sire. Single lambs by Shropshire and Hampshire rams were equal in weight at 145 days of age and were from 4 to 5 lbs. heavier than the lambs by Southdown and Cheviot rams. At this age the single lambs by any of the sires weighed from 75 to 80 lbs. There was no evidence of marked superiority of any one of the four breeds of rams.

**Feeding lambs on pasture,** F. G. KING and C. HARPER (*Indiana Sta. Bul. 353 (1931), pp. 12, figs. 3*).—This study was undertaken in cooperation with the U. S. D. A. Bureau of Animal Industry to determine the value of feeding shelled corn to lambs grazing on red clover pasture and the value of different rations as supplements to red clover pasture (E. S. R., 65, p. 61). Four groups of 18 ewes and 20 lambs each were given free access to 5 acres of red clover for the 60-day feeding period. All the lambs suckled their mothers throughout the test, and lots 1 to 3, inclusive, were fed in creeps twice daily. Lot 1 received a supplemental ration of equal parts of coarsely cracked corn, crushed oats, bran, linseed meal, cottonseed meal, and molasses; lot 2, equal parts of shelled corn, whole oats, and linseed meal (pea size); and lot 3, shelled corn only.

The lambs in the respective lots made average daily gains of 0.6, 0.7, 0.7, and 0.7 lb. per head. The lambs on pasture only made the cheapest gains and returned the most profit. The lambs in lot 2 made somewhat more gain than the other lots and attained a slightly better market finish. The ration fed in lot 1 was less palatable than either of the other supplemental rations and produced the most expensive gains. Shelled corn was second to pasture alone in economy of gains produced.

**Dried apple pomace for fattening lambs,** H. E. DVORACHEK (*Arkansas Sta. Bul. 268 (1931), pp. 41, 42*).—Ram lambs were divided into 2 lots of 4 head each. The lot receiving dried apple pomace and cottonseed meal appeared to relish the mixture and ate less hay than the corn-fed lot. No bloating or scouring occurred, even when lambs consumed as much as 2.5 lbs. of pomace daily. The lot receiving pomace gained at the rate of 0.2 lb. per head daily, while the corn-fed lambs gained 0.4 lb. per head daily. The corn-fed lambs consumed 0.22 lb. less grain but ate 0.46 lb. more hay daily.

**Pig-keeping,** W. A. STEWART ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 32 (1931), pp. IV+59, pls. 14, figs. 3*).—The different aspects of the swine industry, the breeds and breeding, the feeding, and the housing of pigs are described in this bulletin. The distinctive features of pig farming in Scandinavia are compared with the English system.

**[Swine experiments in Arkansas]**, E. MARTIN (*Arkansas Sta. Bul. 268 (1931), pp. 36–41*).—The results of several experiments, two of which have been continued (E. S. R., 64, p. 464), are noted.

*Forage crops for growing and fattening hogs.*—In this study pasture mixtures composed of cowpeas, soybeans, and Sudan grass were tested, using 6 lots of 8 pigs each averaging 88 lbs. initial weight. The pigs were fed corn, tankage, and minerals from July 22 to September 30, except in lot 5 where no tankage was fed. The average daily gains were 1.5, 1.6, 1.8, 1.8, 1.1, and 1.6 lbs. per head on Sudan, soybean, and cowpea; Sudan and cowpea; Sudan and soybean; Sudan; Sudan, soybean, and cowpea pastures, and in dry lot, respectively. The most economical gains were made in lot 3, followed in descending order by lots 4, 2, 1, 6, and 5.

A second test was carried on with 8 lots of 8 pigs each, averaging 83 lbs. initial weight. The rations fed from December 30 to March 24 in lots 1 and 5 were yellow corn, tankage, and minerals; in lots 2 and 6, yellow corn and minerals; in lots 3 and 7, white corn, tankage, and minerals; and in lots 4 and 8, white corn and minerals. Lots 1 to 4, inclusive, were on rye pasture, and the other lots were in dry lot. The average daily gains in the respective lots were 1.7, 1.4, 1.7, 1.2, 1.9, 0.7, 1.6, and 0.5 lb. per head. On pasture white corn was equal to yellow corn, but in dry lot the yellow corn produced the more economical gains, both with and without tankage. Tankage was more profitable when used in dry lot than when used on pasture.

*Soybeans for growing and fattening hogs.*—A test with 4 lots of 9 pigs each, averaging 84 lbs. initial weight, was carried out, using soybeans planted in the row with the corn. All the lots hogged down corn, and in addition the respective lots received minerals; Virginia soybeans, tankage, and minerals; Virginia soybeans and minerals; and Mammoth Yellow soybeans and minerals. The pigs in lots 2 and 3 had plenty of beans during the early part of the test and none during the latter part, while the reverse was true in lot 4. The average daily gains in the respective lots were 0.9, 1.5, 1, and 1.7 lbs. per head.

*Vitamin B for growing and fattening pigs.*—A basal ration of brewers' rice, meat meal, minerals, and cod-liver oil was fed to 4 lots of 3 pigs each, averaging 40 lbs. per head initial weight. Lots 1 and 2 received the basal ration only, while lots 3 and 4 received in addition 5 and 10 per cent, respectively, of rice polish. The average daily gains in the respective lots were 0.6, 0.6, 0.3, and 0.6 lb. per head.

*The influence of rice polish on the quality of pork.*—In this test 6 lots of 8 pigs each, averaging 53 lbs. initial weight, were fed for 8 weeks. Lots 1, 3, 4, and 5 were in dry lot, and the other 2 lots were on Sudan grass pasture. All lots received a mineral mixture and tankage. In addition lots 1, 2, and 3 received rice polish; lot 4, rice polish and rice hulls; lot 5, corn meal and rice hulls; and lot 6, corn meal. The average daily gains were 1, 1.3, 1.1, 1.2, 1.1, and 1.4 lbs. per head in the respective lots. At the end of this period the same pigs were continued for another 8-weeks period. The lots were handled in the same manner as regards to dry lot and pasture, and all received minerals and tankage. The remainder of the ration in the respective lots was rice polish; brewers' rice; yellow corn; brewers' rice; yellow corn; and yellow corn. The average daily gains for this period were 1.2, 1.9, 2, 1.3, 1.7, and 1.9 lbs. per head, respectively. The carcasses of these hogs, except 2 in lot 1, were graded by the U. S. D. A. Bureau of Animal Industry, and the grades in the respective lots were as follows: Lot 1, 3 soft and 3 soft and oily; lot 2, 7 hard and 1 medium hard; lot 3, 2 hard, 4 medium hard, and 2 medium soft; lot 4, 2 hard, 4 medium hard, and 2 medium soft; lot 5, 4 hard, 3 medium hard, and 1 medium soft; and lot 6, 5 hard. 2 medium hard, and 1 medium soft.

A second test, divided into 1 period of 8 weeks and 1 period of 6 weeks, was carried out with 4 lots of 8 pigs each, averaging 75 lbs. per head. During the first period lot 4 was on rye pasture, and the remaining lots were in dry lot. All lots received a ration containing 10 per cent of tankage, except lot 4 which received it free choice, and 2 per cent of minerals. Lots 1 and 4 received 83 per cent and lots 2 and 3, 74.7 per cent of rice polish, and lots 2 and 3 received 8.3 per cent of ground rice hulls and unground rice hulls, respectively. The average daily gains were 1.3, 1.2, 1.1, and 0.9 per head, respectively. During the second period all lots received yellow corn, tankage, and minerals, and lot 4 was continued on rye pasture. The average daily gains during this period were 2, 1.9, 2, and 2.2 lbs. per head, respectively. The carcass grades for these pigs were as follows: Lots 1 and 2, 4 medium soft and 4 soft; lot 3, 1 medium hard, 4 medium soft, and 3 soft; and lot 4, 7 medium soft and 1 soft.

[**Swine tests in Delaware**], A. E. Tomhave (*Delaware Sta. Bul. 172 (1931), pp. 21, 22*).—Two of these studies have been continued (E. S. R., 64, p. 660).

*Protein supplements for pigs.*—Pigs were divided into 5 lots of 10 head each and were fed on rape pasture for 93 days. Lots 1 and 2 received shelled corn, lots 3 and 4 whole wheat, and lot 5 ground wheat, and the protein supplement fed was tankage in lots 1 and 3. cracked soybeans in lots 2 and 4, and ground soybeans in lot 5. The average daily gains and the feed required to produce 100 lbs. of gain were as follows: Lot 1, 1 lb., 426.4 lbs.; lot 2, 1 lb., 420.6 lbs.; lot 3, 1.1 lbs., 412.4 lbs.; lot 4, 1 lb., 435.7 lbs.; and lot 5, 1 lb., 449.5 lbs.

In a second test 4 lots of 10 pigs each were fed for 103 days in dry lot. In this test tankage and ground wheat produced 0.1 lb. larger daily gains, but required 42.3 lbs. more feed to produce 100 lbs. of gain than did tankage and shelled corn. Tankage and whole wheat produced 0.2 lb. more gain per day and required 18.4 lbs. more feed per 100 lbs. of gain than did soybeans and whole wheat.

*Winter rations for brood sows.*—Sows which received 4.5 per cent of alfalfa leaf meal in addition to their grain ration during the winter months did not produce stronger or heavier pigs at the next farrowing period.

*Forage crops for swine in Delaware.*—A ration of 18 lbs. of wheat and 1 lb. of tankage was fed to two lots of 10 pigs each, one of which was on soybean pasture and one in dry lot. The pigs on pasture made average daily gains of 1.5 lbs. per head and required 387.2 lbs. of feed to produce 100 lbs. of gain, while those in dry lot gained at the rate of 1.3 lbs. per head per day and consumed 434.9 lbs. of feed for each 100 lbs. of gain.

**Swine production in Florida**, A. L. Shealy and W. J. Sheely (*Florida Sta. Bul. 236 (1931), pp. 58, figs. 33*).—The breeding, feeding, management, marketing, and home slaughtering and curing of pork are discussed in this bulletin, together with information on the common diseases and internal and external parasites of swine.

**Hog feeding [at the Virginia Station]** (*Virginia Sta. Rpt. 1928–1931, pp. 45, 46*).—In cooperation with the U. S. D. A. Bureau of Animal Industry, a study was made to determine the effects of certain feeds on the quality of pork. It was known that peanuts and soybeans caused soft pork, and it was found that the addition of cottonseed meal to the ration of hogs that had received peanuts during part of the fattening period tended to harden the pork. Of the pigs so fed 70 per cent produced satisfactory carcasses.

In this test 4 lots of 9 pigs each were self-fed for 14 weeks. Lots 1 and 2 received 82.7 per cent of ground shelled peanuts for 36 days and were then changed to rations containing 73 per cent of corn and 21 per cent of cottonseed meal or 80 per cent of corn and 14 per cent of cottonseed meal and received the latter feeds for 62 days. Lot 3 received corn during the entire 98 days and lot 4 ground shelled peanuts for 98 days. The average consumption of feed was 669.4, 662.4, 682.3, and 664.4 lbs., and the average gain 146.6, 135, 125.6, and 149.7 lbs. per head in the respective lots. The hogs were slaughtered at an average weight of 222 lbs. each, and the carcasses of those that had received peanuts graded softer than the carcasses from corn-fed hogs. In palatability tests the samples from the peanut-fed hogs graded as high as or higher than the corn-fed samples.

**[Swine experiments in West Virginia]** (*West Virginia Sta. Bul. 244* (*1931*), *pp. 13–15, fig. 1*).—The results of three studies by J. H. Longwell are noted.

*Alfalfa and rape excellent forage crops for hogs.*—Feeding trials with a number of forage crops have shown that alfalfa furnishes pasture for pigs from early spring to late fall, that it is quite palatable, and that pigs grown on it are thrifty, strong-boned individuals. Pigs on rape pasture were also thrifty, grew rapidly, and made economical gains.

*Buckwheat middlings a good protein supplement for pigs.*—In trials with pigs from weaning time to market weight, buckwheat middlings when supplying part of the protein in a ration proved equal to or slightly better than linseed meal and cottonseed meal. Protein supplement mixtures composed of tankage, linseed meal, and alfalfa meal 2:1:1; the same proportions of tankage, cottonseed meal, and alfalfa meal; and tankage, buckwheat middlings, and alfalfa meal gave excellent results. Replacing the tankage with fish meal also produced good results. The mixtures containing buckwheat middlings produced more rapid gains and required less feed to produce these gains.

*Vitamins in oats.*—In this study pigs were divided into 4 lots of 5 head each. Lot 1 received a ration in which adequate amounts of vitamins A and D were supplied by yellow corn and alfalfa meal. Lot 2 was fed a ration composed of white corn, buckwheat middlings, and tankage. This ration was deficient in vitamins A and D. Lots 3 and 4 received the white corn ration with oats added. Lot 3 was confined indoors, while lot 4 was allowed outside where the animals were exposed to sunshine. All the pigs in lot 1 grew normally to approximately 225 lbs., and none showed signs of vitamin deficiency. The pigs in the other lots grew normally for 150 days and then began to show symptoms of vitamins A and D deficiency. All the pigs in these lots were eventually affected. Each animal was slaughtered when it reached 225 lbs. of live weight or when it was unable to stand. Chemical analysis of several bones from each animal showed no difference in the composition of bones of pigs from different lots.

**Protein and mineral metabolism in pregnant sows on a normal or high calcium diet compared with a calcium-deficient diet,** R. E. Evans (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 4, pp. 752–798, fig. 1*).—A group of two sows was fed a low-calcium diet at Cambridge University, England, while a similar lot received the same ration with the addition of ground limestone. Both groups were bred and allowed to farrow several consecutive litters. The gilts from these sows were also placed on the experimental diets and were bred to produce a third generation. The animals were confined in concrete pens with no access to soil or green feed.

The deficiency of lime in the ration had no detrimental effect upon the live weight of the pigs at birth. Nitrogen was stored throughout pregnancy, but there was an enhanced conservation within 3 weeks of parturition. This storage of nitrogen was greatly in excess of fetal requirements, indicating that the mother organism added a reserve supply of protein for parturition and lactation.

While ash ingredients were retained by both groups of sows at all stages of gestation, the addition of ground limestone to the ration increased the retention of ash. The percentage of ash intake excreted in the feces was the same in both groups, but the percentage in the urine was higher in the calcium-deficient group. With the advance of gestation there was a decrease in the amount of lime retained by the high-calcium group but an increased retention of lime in the low-calcium group. The former group stored an amount nearly five times that deposited in the fetus, while the latter group sacrificed at least 100 gm. of lime from their own organisms for calcification of the fetus.

There were no indications of increased phosphorus retention with the advance of gestation. The calcium-deficient ration did not interfere with the absorption of phosphorus. The requirements for potassium were much smaller than those for lime and phosphorus, but there was an increased retention of potassium within a short period of parturition. An examination of the blood in the low-calcium group showed a definite though not serious anemia. The highest retention of sodium occurred within a month of parturition.

The effect of the ground limestone on the storage of these materials during the gestation period is shown in the following table:

*Storage of nitrogen and mineral matter during gestation by pregnant sows on high and low calcium rations*

| Kind of ration | Average retention per sow | | | | |
|---|---|---|---|---|---|
| | N | CaO | $P_2O_5$ | $K_2O$ | $Na_2O$ |
| | *Gm.* | *Gm.* | *Gm.* | *Gm.* | *Gm.* |
| High-calcium | 1,439 | 736 | 720 | 201 | 152 |
| Low-calcium | 1,125 | 21 | 647 | 111 | 203 |

**The influence of the addition of calcium carbonate to a ration low in lime on the appetite and digestibility of the food in swine, R. E. Evans** (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 4, pp. 799–801*).—The sows in the low-calcium lot of the above experiment suffered periodically from loss of appetite, though the ration was adequate in other respects.

A series of 11 digestion trials were undertaken with each of the lots. The results showed no indications of a more perfect utilization of the organic constituents of the ration due to the addition of ground limestone to the low-calcium diet.

**[Poultry studies in Arkansas], R. M. Smith** (*Arkansas Sta. Bul. 268* (*1931*), *pp. 42–44*).—These studies have been continued (E. S. R., 64, p. 465).

*The value of rice by-products for laying hens.*—This test was undertaken to determine to what extent yellow corn meal could be included in a rice ration and adequately substituted for the cod-liver oil supplement. The results on the basis of production, hatchability, and fertility indicated that the quantity of yellow corn necessary must be considerable.

*The value of rice by-products in the growing ration.*—In this test a check ration composed of 30 per cent of yellow corn meal, 25 per cent of wheat middlings, 25 per cent of wheat bran, 10 per cent of meat scrap, 5 per cent of dried buttermilk, 3 per cent of bone meal, 1 per cent of salt, and 1 per cent of cod-liver oil with scratch feed made up of finely cracked yellow corn, and a rice ration consisting of 40 per cent of rice bran, 40 per cent of rice polish, and the remainder of the ration as above, were fed in three tests to White Leghorn, Barred Rock, and White Leghorn chicks, respectively. At the end of 8 weeks the chicks in the check ration lots averaged 512, 623, and 543 gm. and those in the rice ration lots 540, 537, and 501 gm. per head, respectively. While the rice ration was not as palatable as the corn ration, it promoted normal growth and health of chicks during 8 weeks of brooding.

*The influence of mineral, cod-liver oil, alfalfa leaf meal, and sprouted oats on the production, hatchability, and fertility of eggs.*—The basal mash used in this study was supplemented in the six pens as follows: Pen 1, no supplement; pen 2, minerals; pen 3, cod-liver oil; pen 4, alfalfa leaf meal; pen 5, sprouted oats; and pen 6, alfalfa leaf meal and sprouted oats. The percentage egg production in the respective lots was 43.9, 34.4, 46.3, 44.5, 49.2, and 40.6, the percentage fertility 93.3, 97.2, 93 5, 91.1, 93.1, and 94.3, and the percentage hatchability 86.1, 73.4, 76.1, 86, 79.2, and 88.8. The sprouted oats was the only supplement that gave a profitable increase in egg production, while none of the supplements appreciably increased the fertility or hatchability of the eggs produced.

[**Poultry experiments in Delaware**], A. E. Tomhave and C. W. Mumford (*Delaware Sta. Bul. 172 (1931), pp. 23, 24*).—The results of two studies are noted.

*Utilization of ground soybeans for poultry.*—Continuing this study (E. S. R., 64, p. 665), it was found that when a laying ration contained more than 7 per cent of ground soybeans the egg production per hen decreased and mortality increased. Even when only 7 per cent of ground soybeans was fed the production per bird was 9 per cent less than in the check pen. Ground soybeans did not cause a deterioration or change in the color of yolks of eggs that had been in cold storage for periods of 4, 6, and 9 months.

In a second phase of this study 3 pens of 301 chicks each were fed rations containing 0, 6.9, and 13.2 per cent, respectively, of ground soybeans. The chicks averaged 0.08 lb. initial weight, and in the respective lots made average gains of 3, 2.9, and 2.5 lbs. per bird. The average feed requirements per pound of gain were 5.1, 4.9, and 5.1 lbs. per bird, respectively.

*Study of fiber in rations for rearing chicks.*—In this test 4 lots of 275 chicks each were fed for a 20-week period on rations containing 5.08, 7.2, 4.62, and 4.92 per cent of fiber, respectively. In the respective lots the average weight per head at 20 weeks was 2.5, 2.5, 2.7, and 2.9 lbs. The average feed requirement per pound of gain was 6.5, 7.3, 5.8, and 7 lbs., and the mortality over the 20-week period was 19, 33, 19, and 8 birds.

[**Experiments with poultry in Virginia**] (*Virginia Sta. Rpt. 1928–1931, pp. 72, 73*).—Three studies are briefly noted.

*Peanut meal as a source of protein for [laying hens].*—Rations in which peanut meal was substituted for meat scrap in varying proportions were fed to 5 lots of 25 Barred Rock pullets each. At the end of 6 months the results indicated that peanut meal could be substituted for some of the meat scrap without decreasing egg production or injuring the quality of the eggs.

*Pigmentation in chicks reared in battery brooders.*—In a test with 5 lots of 50 Barred Rock chicks each in a battery brooder, the results obtained during an 8-week period indicated that the addition of alfalfa leaf meal increased the pigmentation of shanks and beaks without affecting the growth of the chicks.

*Mazda CX lamp as a source of ultra-violet rays for poultry.*—At the end of 8 weeks of a test there were no signs of rickets among lots of chicks fed cod-liver oil or in lots irradiated with a Mazda CX lamp, while in the control lot practically 100 per cent of the chicks were rachitic.

**The influence of suprarenal cortex and medulla on the growth and maturity of young (White Leghorn) chicks,** A. G. Eaton, W. M. Inkso, jr., G. P. Thompson, and F. E. Chidester (*Amer. Jour. Physiol., 88 (1929), No. 2, pp. 187–190, fig. 1; abs. in West Virginia Sta. Bul. 244 (1931), p. 53*).—Male White Leghorn chicks fed desiccated suprarenal cortex matured more rapidly than control chicks, as indicated by the weight of the testes. Their body weights, like those of the females in the cortex group, nearly equaled those of the control lot. Chicks fed suprarenal medulla grew less rapidly, and the weight of the testes was below that of the control or cortex groups.

**Final report of fifth Panhandle egg laying contest, October 1, 1930, to September 22, 1931,** O. S. Willham (*[Oklahoma] Panhandle Sta., Panhandle Bul. 33 (1931), pp. 26*).—This is the final report of the fifth Panhandle egg-laying contest, held at Goodwell, Okla. (E. S. R., 64, p. 169).

**Peafowl and their care,** W. L. McAtee (*U. S. Dept. Agr. Misc. Pub. 127 (1931), pp. 4*).—A brief practical account of the common or Indian peafowl (*Pavo cristatus*), followed by a brief description of the green or Javan peafowl (*P. muticus*).

## DAIRY FARMING—DAIRYING

**[Experiments with dairy cattle in Virginia]** (*Virginia Sta. Rpt. 1928–1931, pp. 9, 43, 44*).—The results of three studies are noted.

[*Feeding value of dried apple pomace*].—Continuing this study (E. S. R., 59, p. 467), it was found that 1 ton of dried beet pulp was equal to 4 tons of corn silage, whereas 1 ton of dried apple pomace was equal to 3 tons of corn silage.

[*Comparison of alfalfa and timothy hay as sources of proteins and minerals*].—In this study, in cooperation with the U. S. D. A. Bureau of Dairy Industry, it was found that groups of cows receiving alfalfa hay uniformly sustained milk production better and produced 16 per cent more milk than groups of cows receiving timothy hay. Digestion trials showed but slight variations in the digestibility of the proteins of the two hays. The excess of calcium in the alfalfa hay apparently affected the retention of calcium by the animals, and balances were greater during the periods when the same animals were fed timothy hay.

*Pasture experiments.*—In this test 4 10-acre pastures were used. Plats 1 and 2 were fertilized by applying 1 ton of ground limestone per acre and 1,000 lbs. of an 8–8–8 fertilizer (half of the nitrogen applied in April and half in July), and plats 3 and 4 were unfertilized. Plats 2 and 3 were subdivided into 3 equal parts, and the animals were rotated. The number of cow days on the respective pastures were 651, 688, 227, and 209. The production of milk, calculated to a 4 per cent basis, was 16,770, 14,421, 3,190, and 2,900 lbs., respectively. The animals in the respective lots gained 341, 777, 569, and 438 lbs. in weight.

**[Experiments with dairy cattle at the West Virginia Station]** (*West Virginia Sta. Bul. 244 (1931), pp. 16, 17, 18–20, fig. 1*).—The results of several studies are noted.

*Effect of low calcium and low phosphorus rations on growing dairy heifers.*—Continuing this study (E. S. R., 63, p. 69), H. O. Henderson, K. S. Morrow, R. B. Dustman, and C. E. Weakley, jr., fed 11 animals on various experimental rations for 2 years in this phase of the work. One group was fed a normal ration, another a ration low in calcium, another a ration low in phosphorus, and another a ration low in both calcium and phosphorus. At this stage all the animals appeared to be in a fairly thrifty condition, and no consistent differences due to rations were apparent. The older animals receiving mineral-deficient rations showed depraved appetities by chewing mangers. Chemical analyses of the blood showed that it was possible to vary the inorganic phosphorus content by feeding rations high or low in phosphorus. but the results with calcium were uncertain. The inorganic phosphorus content of the blood varied greatly from day to day, but the fluctuations in calcium content were much less pronounced.

*Water consumption of dairy animals.*—Morrow and R. A. Ackerman found wide variations in the amount of water consumed by individual animals kept under the same conditions and fed the same rations. Some yearling heifers consumed 25 lbs. of water daily, while similar animals under identical conditions drank 75 lbs. During a 28-day period two lactating cows receiving mangels consumed 40.0 and 73.5 lbs. of water daily, and when the ration was changed to include corn silage drank 75.1 and 101 lbs. of water per day, respectively. No detrimental effects were noted on the health or growth of calves given water while being fed milk.

*Varieties of pasture for milk production.*—A series of 8 pasture plats was laid out by Henderson, R. J. Garber, and Ackerman, 2 being seeded to bluegrass and white clover; 2 to oats, Canada field peas, sweetclover, and Sudan grass; 2 to oats and sweetclover; and 2 to Sudan grass. The sweetclover pasture withstood drought better than the bluegrass-white clover mixture, while Sudan grass failed to make much growth due to dry weather. When first placed on sweetclover cows did not eat it readily, but after a few days appeared to relish it, and there were no bad effects on the animals.

*Roots as a feed for dairy cows.*—Using the reversal method, Morrow and Henderson fed two groups of cows through 4-week periods on rations of grain and hay and either corn silage or mangels. There was no apparent difference in the amount of butterfat produced on the two rations, but there was a slight difference in milk production in favor of the mangel ration. The results showed that mangels could be substituted for corn silage on an equal dry matter basis.

*Soybean v. alfalfa hay for milk production.*—Two more trials have been run by Henderson under the same plan as previously noted (E. S. R., 50, p. 73). During the respective trials the cows refused 23 and 10 per cent of the soybean hay and 3 and 0 per cent of the alfalfa hay. In the first trial the 10 cows when fed alfalfa hay produced 16 lbs. more milk and 2.22 lbs. more butterfat than they did when fed soybean hay, and in the second trial there was a difference of 167.2 lbs. of milk and 3.3 lbs. of butterfat in favor of the alfalfa hay. Neither ration was better than the other for maintaining body weight. Combining the four trials there was a difference of less than 0.2 lb. of butterfat in the production of 40 cows fed the two kinds of hay over 21-day periods. The results led to the conclusion that when soybean hay was cut before it became coarse it was practically equal to alfalfa hay.

**Dried tomato pomace in the dairy ration,** A. E. Tomhave (*Delaware Sta. Bul. 172* (*1931*), *p. 23*).—Using the double reversal method 2 lots of 5 cows each were fed through 4 28-day periods with 3-day transition periods. It was found that 1.75 per cent more milk and 3.27 per cent more butterfat were produced on the check ration, and the percentage of butterfat in the milk was 1.49 per cent in favor of this ration as compared with one containing 15 per cent of dried tomato pomace.

**Raising dairy calves,** H. W. Cave (*Kansas Sta. Circ. 161* (*1931*), *pp. 14, figs. 6*).—Prenatal care, management and feeding of young calves, housing, marking and dehorning, and some of the common diseases of calves are discussed in this publication.

**[Dairying experiments at the New York State Station]** (*New York State Sta. Rpt. 1931, pp. 22, 23, 46, 47*).—Two studies are briefly noted.

*Heat-loving bacteria in pasteurized milk and other dairy products.*—Milk containing large numbers of heat-loving bacteria was fed to rabbits and guinea pigs without any harmful effects.

*Pasteurization and cooling of milk in the vat.*—In this study it was found that by using brine temperatures as low as from 10 to 15° F. for cooling milk in the pasteurizing vat after the temperature had first been reduced to from 90 to 100° by cold water it was possible to cool milk entirely in the vat without decreasing its creaming ability. With cooling surfaces in the pasteurizer it was possible to pasteurize, hold, and cool milk within a period of approximately 1 hour.

**[Dairying experiments in West Virginia]** (*West Virginia Sta. Bul. 244 (1931), pp. 20–23*).—The results of three studies are noted.

*Microflora of raw and pasteurized grade A milk.*—The efficiency of pasteurization as determined for 103 samples of milk by L. M. Thurston and H. C. Olson increased as the bacterial count of the raw milk increased. This was explained on the basis that a fairly constant number of resistant organisms exist in milk of any grade, making the proportion surviving in milk of low initial count high as compared with milk of higher initial count. A study of types of organisms before and after pasteurizing showed that acid-forming and inert bacteria and peptonizing organisms increased following this process, while acid-coagulating and alkali-forming bacteria decreased. Pasteurized grade A milk was found to keep considerably longer than the corresponding raw milk. The coagulation of the raw milk was due to the developed acid, while the coagulation of pasteurized milk was due to a rennin-like enzyme secreted by the bacteria.

*Flavor in dairy products.*—In this study Thurston found that standardizing skim milk with washed cream containing a minimum of fat-globule films lowered the rich flavor of the product as compared with normal whole milk or with buttermilk standardized with unwashed cream. These results confirm the theory that fat-globule films do give milk some of its rich flavor.

*Manufacture of sweet-curd, rennet-coagulated cottage cheese.*—In studying the manufacture of sweet-curd, rennet-coagulated cottage cheese Thurston found that regardless of variations in other factors a whey acidity of 0.35 per cent or more was necessary to produce curd with a desirable body. A lower acidity always produced a rubbery curd. Calcium chloride proved to be of no value in hastening coagulation by rennin or in firming the curd during "cooking." Varying the amount of rennet extract from 1.33 to 3.33 cc. per 1,000 lbs. of skim milk had no apparent effect upon the manufacturing process or upon the character of curd produced from skim milk pasteurized at 185° F. for 20 minutes. It was possible to reduce the making time of this cheese from 18 to 8 hours by the quicker development of lactic acid. The gas which developed in some curd could be removed and its effects largely overcome by heating the curd in the whey to 150° or higher. These results were obtained when the skim milk was pasteurized at 185° for 20 minutes, but did not apply to milk pasteurized at 145° for 30 minutes.

**Market milk,** E. Kelly and C. E. Clement (*New York: John Wiley & Sons; London: Chapman & Hall, 1931, 2. ed., rev., pp. XXII+489, figs. 139.*)—A revised edition of this treatise, previously noted (E. S. R., 48, p. 577).

**Cheese investigation** (*Virginia Sta. Rpt. 1928–1931, pp. 44, 45*).—W. D. Saunders found that by equalizing the content of butterfat and casein in the milk a cheese could be made which would contain 50 per cent of butterfat in the dry matter and 40 per cent of moisture. Such cheese soon dried out to 39 per cent of moisture, the amount required by law.

A method for making satisfactory cheese from milk containing as much as 0.35 per cent of acid was worked out. The method consisted of adding water to the cheese vat immediately after the curd was cut and then reducing the acid in the whey to 0.1 per cent or less. Cooking was done at a temperature not above 100° F., and the curd was allowed to lie in the whey about 2 hours or until the acid in the whey had risen to about 0.18 per cent.

**The influence of the method of production on the calcium content and body of cheese** [trans. title], G. Wode (*K. Landtbr. Akad. Handl. och Tidskr., 69 (1930), No. 7, pp. 1032–1043; Eng. abs., p. 1041*).—In this study a close correlation was found between the calcium content and the body of cheese. The more calcium present the weaker was the body. Calcium was removed from the curd by the vat-whey and also by the whey removed during the pressing process. The amount of calcium removed by the vat-whey increased with the acidity of the milk before setting. When the vat-whey was separated rapidly from the curd, the amount of calcium removed decreased. The amount of calcium dissolved from cheese by the press-whey increased with the increased volume and acidity of the press-whey. The total amount of calcium dissolved by the vat-whey was considerably greater than that removed by the press-whey. However, the variations of calcium content were practically the same in both kinds of whey, and for this reason the press-whey was able to cause practically as much change in the calcium content of the cheese as the vat-whey.

**Seventeenth annual report of the creamery license division**, T. H. Binney (*Indiana Sta. Circ. 185 (1931), pp. 19, fig. 1*).—This is the annual report of the State creamery license division for the year ended March 31, 1931 (E. S. R., 65, p. 67). It deals with the comparative annual production of dairy products in Indiana, the creamery inspection, and the examination of testers.

**The preparation, testing, and use of chlorine disinfectants**, A. C. Fay (*Kansas Sta. Circ. 160 (1931), pp. 8, fig. 1*).—The author describes methods for preparing homemade hypochlorite disinfectants at a cost of from 10 to 25 cts. per gallon. The detailed procedures include preparation of calcium and sodium hypochlorites from bleaching powders and of sodium hypochlorite from chlorine gas. A simple, practical test for determining the percentage of available chlorine in the stock solution and the parts per million in the final rinse water are also described. A formula is given which makes possible the calculation of the proper dilution of any stock chlorine solution to yield a chlorine rinse water of any desired strength. The precautions to be observed in the use of chlorine disinfectants are discussed.

## VETERINARY MEDICINE

**Report of the parasitologist**, H. L. Van Volkenberg (*Porto Rico Sta. Rpt. 1930, pp. 38–40*).—The stomach worm was found to be the most common and widespread of the internal parasites of cattle, closely followed by the nodular worm, as was determined by autopsies, abattoir observations, and fecal examinations. The nodular worm is of great importance due to the losses it causes, no effective curative treatment being known, and older animals do not acquire the resistance to it that they do to the stomach worm. The lungworm and hookworm are serious pests on certain farms and in restricted areas. Coccidia were very frequently found in fecal examinations, but only in a few instances has coccidiosis been observed. Cattle of all ages are attacked by the cattle tick and liver fluke. There appears to be only one species of snail that serves as the intermediate host of the liver fluke on the island, and by the destruction of it the fluke can be controlled.

Since the native goat is attacked by a great variety of external and internal parasites, the flocks are successfully raised only in the more favorable dry regions. The lungworm and the kidney worm are the most serious parasites of swine. The thorny-headed worm and the swine hookworn (*Crassisoma* sp.) are common but apparently are not important. For some unknown reason the ascarid is not a common parasite.

Of the important internal parasites of poultry, capillarids have been most frequently met with, followed by species of the genus Heterakis and Ascaridia. The tapeworm has been found less frequently than the ascarid. Coccidia are said to have been encountered in over one-third of the fecal examinations.

In reporting upon bovine piroplasmosis, it is pointed out that there are two or more types of the disease which occur on the island, the more common type, which is found in Mayaguez and vicinity, being due to a parasite corresponding to *Piroplasma argentinum*, which occurs in South America. This form of the disease responds to treatment with quinine, especially if administered early in the attack. Injecting quinine hydrochloride intravenously in doses of 5 gm. daily per adult animal has been found to hasten the action of the remedy.

Search has been under way for the intermediate host of *Moniezia expansa*, the common tapeworm of cattle in Porto Rico, which is also a parasite of goats, although the native goat is not a natural host. This tapeworm is more common in young cattle, not more than one or two tapeworms being commonly found in adult cattle. Attempts to infest several kinds of insects with this parasite gave negative results. In field collections the dung beetle *Ataenius stercorator* was found infested with a cysticercoid, and the water beetle *Tropisternus collaris* also harbors a cysticercoid, probably the tapeworm of a water-feeding bird. This water beetle was also found infested with the embryo of the thorny-headed worm. It was found possible to infest both pigs and calves with this thorny-headed worm by feeding the beetle, but the worm would not develop in the calf.

**On the feeding habits and pathogenic action of Chabertia ovina (Fabricius, 1788),** R. Wetzel (*North Amer. Vet.*, *12* (*1931*), *No. 9*, *pp. 25–28*, *fig. 1*).—It is pointed out that the nematode *C. ovina*, parasitic in the large intestine of sheep, goats, cattle, and other ruminants, attaches itself to the mucous membrane of the colon by drawing a portion of the propria mucosae into the buccal capsule. It actually feeds on the propria mucosae, the elements of which are swallowed after having been submitted to a predigestion in the buccal capsule. Besides this mechanical destruction of the superficial layers of the mucosa, a toxic action by the worm is suspected of playing a part in the pathologic processes.

**The North American lung fluke,** F. G. Wallace (*Science*, *73* (*1931*), *No. 1896*, *p. 482*).—This is a preliminary note on studies of *Paragonimus kellicotti*, which has been reported from cats, dogs, and pigs in the United States since 1894, although its life history, until the present time, has remained unknown. This fluke has been found to be a not uncommon parasite of the native mink (*Lutreola vison*). Large numbers of distome metacercariae were found in November, 1930, in *Cambarus immunis spinirostris* in a small creek near Minneapolis, Minn. Thirty-two per cent of the crawfish examined in this creek were found infected. The cysts, which varied in number from 1 to 8, without exception were found in the pericardial cavity, and cats fed these cysts developed *P. kellicotti*. Evidence was thus obtained that at least one species of native crawfish serves as second intermediate host of the lung fluke.

**Differential filtration as a means of isolating Bacterium granulosis,** R. E. KNUTTI, P. K. OLITSKY, and J. R. TYLER (*Science, 73 (1931), No. 1904, pp. 709, 710*).—The fact that it is often difficult to separate very small slowly growing from larger more rapidly growing bacteria, this being especially true in attempts to obtain *B. granulosis* in a pure growth from cultures of conjunctival suspensions, led to the studies here reported. By means of differential filtration the authors were able to separate *B. granulosis* from contaminated cultures from which it had been difficult or impossible to recover the organism in the usual manner.

**The question of prenatal infection in anaplasmosis,** G. DIKMANS (*North Amer. Vet., 12 (1931), No. 9, pp. 21–23*).—The question of prenatal infection with anaplasmosis is reviewed by the author.

**The virus of boutonneuse fever (exanthematous fever) obtained from the blood of a patient or from the body of a tick is filtrable** [trans. title], G. BLANC and J. CAMINOPÉTROS (*Compt. Rend. Acad. Sci. [Paris], 192 (1931), No. 23, pp. 1504, 1505*).—The authors find that the virus of boutonneuse fever is not precipitated by centrifugation for 20 minutes at 2,500 r. p. m. The virus present in the blood serum and in the body of the brown dog tick is filtrable, passing through Chamberland L 2 and L 5 filters.

**A preliminary report on dried rinderpest vaccine,** M. M. ROBLES and J. D. GENEROSO (*Philippine Jour. Agr., 1 (1930), No. 4, pp. 367–379, figs. 5*).—The experiments reported have shown that the drying of tissue rich in rinderpest virus in a desiccator under constant refrigeration rendered the tissue avirulent without destroying its immunizing power. In five separate tests where two different lots (33 to 36 days old) were used, none of them produced rinderpest in susceptible animals.

**A brief résumé of rinderpest control work in the Philippines,** V. FERRIOLS (*Philippine Jour. Agr., 1 (1930), No. 4, pp. 393–409*).—This is a review of the control work with rinderpest in the Philippines, into which the disease is believed to have been introduced in 1886 with work animals from China.

**The therapeutic value of Brucella abortus bacterin administered intravenously,** W. A. JAMES and R. GRAHAM (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 3, pp. 391, 392*).—The intravenous administration of *B. abortus* bacterin of the porcine form to reacting cows, presented in detail in tabular form, failed to alter appreciably the agglutinin content of blood and milk of 10 animals over a period of 6 months following treatment. No ill effect of the treatment was noted.

**The effect of colloidal carbon with adsorbed flavines on the Brucella agglutinin titre of reacting cows,** W. A. JAMES and R. GRAHAM (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 3, pp. 394–396*).—In a study of the curative properties of colloidal carbon with adsorbed flavines in the treatment of animals reacting to infectious abortion, no indication was obtained of curative properties from the weekly blood tests made during the course of the treatment and after an interval of approximately six months. No injurious effect from the treatment was observed.

**Correlation of blood reactions with the breeding records over a period of years in an abortion-infected herd of cattle,** C. F. CLARK (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 3, pp. 290–331*).—This contribution from the Michigan Experiment Station reports upon data obtained since March, 1926, from a purebred herd of from 60 to 100 animals of breeding age in which infectious abortion existed for the past 20 years. In the course of this work, the details of which are presented at length in tabular form, monthly agglutination tests were made of all the animals of breeding age, all available fetal membranes were examined, breeding records were recorded, and the usual clinical treatment was applied to all cases of retained fetal membranes and other ailments of the genitalia. The findings have led to the following conclusions:

Positive animals had two and one-half times more abortions than negative animals. Sterility was four times more frequent in suspicious animals, and eight times more frequent in positive animals, than in those with a negative history. Retention of the fetal membranes occurred with almost equal frequency in negative, suspicious, and positive groups. A majority of positive animals (62 per cent) and an appreciable number of suspicious animals (11 per cent) had *Brucella abortus*-infected udders. Of animals positive in 1: 50, 38 per cent became negative, 33 per cent became suspicious, and 28 per cent became positive. Of animals positive in 1: 100, 11 per cent became negative, 22 per cent became suspicious, and 67 per cent became positive. Of animals positive in 1: 50 or 1: 100 for 5 to 10 months, only 2 per cent became negative. Animals positive in 1: 50 or 1: 100 more than 10 months did not become permanently negative.

**Oesophagostomiasis of cattle in the Philippines**, E. C. Fariñas (*Philippine Jour. Agr., 1 (1930), No. 4, pp. 381–391, pls. 2, figs. 4*).—This is a brief report on the incidence of esophagostomiasis of cattle in the Philippines, with notes on its diagnosis and control.

**The infectivity of the blood in artificial and natural cases of bovine pleuro-pneumonia**, G. N. Hall and W. G. Beaton (*Jour. Compar. Path. and Ther., 44 (1931), No. 3, pp. 170–179*).—The authors report upon experimental transmission of infection by blood inoculation, the isolation of the virus in pure culture from the blood, the period at which the blood becomes infected in cases of artificial infection with the virus of pleuropneumonia and the period which it retains the infection, and the infectivity of the blood in natural infections and blood cultures as a means of diagnosis.

**Observations on a pyogenic infection of sheep**, W. Jowett (*Jour. Compar. Path. and Ther., 44 (1931), No. 3, pp. 202–208, figs. 2*).—An account is given of several cases of a pyogenic infection of sheep and of its causal organism, *Bacterium purifaciens*, an earlier reference to which has been noted (E. S. R., 64, p. 74).

**Gas gangrene infections of sheep**, R. S. Roberts and A. D. McEwen (*Jour. Compar. Path. and Ther., 44 (1931), No. 3, pp. 180–191*).—This is an account of a bacteriological examination made of 68 cases of gas gangrene, usually caused by *B[acillus] chauvoei*, which causes serious mortality in sheep in the Romney Marsh in Kent County, England. In gas gangrene of lambs the infection gains entrance to the body through wounds inflicted at castration or docking. The soil of the marsh appears to be heavily contaminated by *B. chauvoei*, *V[ibrion] septique*, and *B[acterium] paludis*, only the first of which was encountered in cases of gas gangrene. *B[acillus] oedematiens* appeared to be the cause of the disease in one case. *V. septique* has not been proved to be the cause of gas gangrene, and it has not been definitely incriminated in any of the authors' investigations into sheep diseases. It is frequently recoverable, apparently as a post-mortem invader, from the bodies of animals that have been dead for some time. Prophylactic measures should be directed primarily against a *B. chauvoei* infection.

**Diseases of goats in Nigeria.—II, Notes on a fatal septicaemic infection**, W. G. Beaton (*Jour. Compar. Path. and Ther., 44 (1931), No. 3, pp. 192–201*).—This contribution reports on observations of an exceedingly virulent disease of goats in Nigeria due to a minute coccobacillus. It was found that sheep can also be artificially infected by the organism. The first paper in this series, entitled Contagious Pleuro-pneumonia of Goats in East Africa, was by Mettam (E. S. R., 63, p. 872).

**Two tapeworm parasites from the carabao, with special reference to a new species of Avitellina,** M. A. Tubangui and E. C. Fariñas (*Philippine Jour. Agr., 1 (1930), No. 4, pp. 421–429, pls. 2*).—Notes are presented on a new species of the genus Avitellina, namely, *A. bubalinae*, and on *Moniezia benedeni* (Moniez) R. Bl., a well-known parasite of sheep and cattle in many countries but here reported for the first time from the Philippine Islands and from a new host.

**Bacterium viscosum equi (Adsersen) in suckling pigs and its relation to Bacillus polymorphus suis (Degen) in focal interstitial nephritis in swine: A contribution to our knowledge of diseases in the new-born in swine,** H. Magnusson (*11. Internatl. Vet. Cong., London, 1930, Rpts., vol. 3, pp. 488–507, pls. 4*).—It is pointed out that in Sweden, where hog cholera does not occur, practically all deaths of suckling pigs are due to causes other than primary infections. In examinations made during a period of 15 years of 1,667 cases, only 563 proved to have been caused by virus infection or by parasites. Of these, 217 were referred to erysipelas, and 239 to Pasteurella pneumonia. Among the specific forms of infection sometimes met with in new-born pigs, mention is made of that due to *Bacterium viscosum equi*. In an examination made of 5 cases in the same litter due to this infection, the most characteristic changes proved to be purulent polyarthritis and renal hemorrhages. In 3 of the cases there was also endocarditis with purulent thrombi. Tests proved that the organism isolated was pathogenic for swine and horses and capable of producing chronic cold abscesses in rabbits.

On account of the statements found in the literature that *B. viscosum equi* is identical with *Bacillus polymorphus suis* Degen 1907, which often occurs in focal interstitial nephritis in adult pigs and is therefore a very common organism in swine, 4 of the above-mentioned renal cases were examined. *B. polymorphus suis* was isolated in pure culture, and the correctness of the observations of Degen (E. S. R., 20, p. 1084) was in the main confirmed. This organism is a hemolytic, Gram-negative rod, which in the system is closely related to *Bacterium viscosum equi* and *Bacillus purifaciens* in sheep, but is quite different from these and does not, like *Bacterium viscosum equi*, form any slimy or tough colonies. Even serologically it differs—is difficult to keep alive and almost avirulent for all laboratory animals tested, even pigs. It is considered as probably, like *Bacillus pyelonephritis bovis*, a secondary invader with a predilection for the kidney tissues.

**Infection of pigs through the skin with the larvae of the swine kidney worm, Stephanurus dentatus,** B. Schwartz and E. W. Price (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 3, pp. 359–375*).—In experimental work with *S. dentatus*, infective larvae when placed on the intact skin of pigs failed to produce infestations in the various tissues and organs in which this parasite is known to occur. The infective larvae penetrated the scarified skin of pigs readily and produced typical lesions and worm infestations in the tissues and organs in which they occur normally. When injected subcutaneously into pigs, the larvae produced characteristic lesions and worm infestations in the various tissues and organs which are susceptible to the parasite. It is considered probable that under normal conditions of swine husbandry the larvae would have opportunities of coming in contact with the injured skin of swine, and in such cases infestations with this parasite would result.

Following experimental percutaneous infections, the larvae reached the liver, spleen, pancreas, perirenal fat, kidneys, psoas muscles, and other abdominal organs and tissues. They also localized in thoracic organs, particularly in the lungs. In experimental percutaneous infections, the larvae were found in the liver and in adjoining abdominal organs and tissues long before they occurred in the perirenal fat and in the renal organs. The worms apparently reached the liver through the systemic circulation and many of them remained in the hepatic blood vessels, particularly in the portal vein and in the gastrohepatic artery, where they produced thrombi. The immature worms penetrated the hepatic tissue, presumably by perforating the hepatic blood vessels, and worked their way to the liver capsule, which they perforated. The worms which got into the abdominal cavity migrated freely, and in this way they apparently reached the perirenal fat, which they penetrated and in which they established tracts to the ureter.

**Studies on Shigella equirulis (Bact. viscosum equi)**, P. R. EDWARDS (*Kentucky Sta. Bul. 320 (1931), pp. 289–330, figs. 6*).—The first part of this contribution (pp. 291–304) reports upon a comparative study of the cultural, morphological, biochemical, and serological properties of 40 cultures of *S. equirulis*. Part 2 (pp. 305–319) deals with rough and smooth variants, and part 3 (pp 320–327) with the occurrence of dwarf colony variants.

While this organism has for 15 years been recognized in Europe as a serious factor in septicemia, arthritis, and nephritis of foals, its presence in America has only recently been recognized. It is now known to be responsible for the early death of a larger number of foals than any other individual microorganism. Foals infected with this bacterium frequently die within 18 hours. The average age at death as reported by Dimock, Edwards, and Bullard (E. S. R., 59, p. 780) is 2.9 days. The organism referred to by Good and Smith in their report upon joint ill as *Bacillus abortivo-equinus* (E. S. R., 31, p. 887) is considered to be *S. equirulis*.

The presence of extensive variations in the cultural characters of the bacterium was noted and these are described. All the strains were found uniformly pleomorphic, their cultural characters being similar, although exhibiting some variation due to dissociation. The biological reactions of the organisms were comparatively uniform. Slight differences were noted in the fermentative reactions and ability of the various cultures to coagulate milk. The organisms were extremely diverse in their serological characters. Using seven agglutinating serums, only three cases of identity were noted in the 40 strains. The most distinctive character of the organism is its inability to survive for more than 10 days on the surface of an agar medium when kept in the dark at room temperature.

"The presence of rough and smooth variation was apparent throughout the course of the work. Changes in the mucoid character of the organism also were noted, and it was demonstrated that the change from mucoid to nonmucoid is associated with the change from rough to smooth. Rough colonies are always mucoid, while nonmucoid colonies are always smooth. There is a transitional stage of smooth mucoid. The trend of the variation in artificial cultures is from rough to smooth. The rate at which the change from rough to smooth occurs varies from strain to strain and may vary within the same strain at different times. The rough form can be perpetuated in cultures only by continued selection. Growth in broth, incubation at lower temperature, and alkaline reaction favor the development of the rough form. Growth on agar, incubation at a temperature above 37° C., and acid reaction accelerate the change from rough to smooth. The two forms are closely related serologically. The rough form produces a larger amount of specific substance than the smooth form. Both rough and smooth cultures were isolated directly from the tissues of diseased foals, either alone or associated.

"In addition to rough and smooth dissociation another type of variation resulting in the formation of dwarf colonies was observed. These dwarf races, while differing markedly in their cultural behavior, are morphologically and biochemically identical with normal strains of *S. equirulis*. Certain of these variants were shown to be serologically identical with normal strains derived from the same source. The rough and smooth and mucoid and nonmucoid dissociation occurring in normal cultures was observed in the dwarf strains. Furthermore, the characters of the dwarf cultures as regards roughness or smoothness and the presence or absence of the mucoid state were the same as the characters of the normal strain with which they were associated or from which they were derived. The growth of the dwarf variants could be stimulated greatly by the addition of blood serum, ascitic fluid, cabbage juice, or potato juice to the medium. Fresh meat infusion also stimulated the growth of the dwarf strains. The stimulating substances are quite heat stable, resisting autoclaving for 4 hours

"Dwarf strains were recovered from stock cultures of normal strains and directly from infected foals. Rough mucoid and smooth nonmucoid strains also were isolated directly from the animal body. The recognition of these variants is of importance in the diagnosis of the disease."

**Poultry diseases,** W. L. Bleecker and R. M. Smith (*Arkansas Sta. Bul. 268 (1931), pp. 44, 45*).—A brief reference is first made to investigations of various vermifuges for use in poultry flocks. In this work 15 gm. of kamala were found to be quite effective against tapeworms but not of much value against other intestinal parasites. It is concluded from the results obtained that the use of a vermifuge may be overdone, that they should be administered early in the fall before the fowls get into production, and that probably not more than two treatments should be given.

**Avian pest, a disease of birds hitherto unknown in the Philippine Islands,** E. C. Fariñas (*Philippine Jour. Agr., 1 (1930), No. 4, pp. 311–365, pls. 5*).—This is a report of studies of a disease caused by a filter-passing virus, described as an acute, febrile, infectious disease characterized by dyspnea, diarrhea, and inappetence, with nerve injury which is manifested by various locomotor disturbances in birds that survive the acute attack. It is said to be the same as the Newcastle disease in England reported by Doyle (E. S. R., 58, p. 77), pseudo-fowlpest in Java reported by Picard (E. S. R., 61, p. 74), and Ranikhet disease in India (E. S. R., 66, p. 374).

Data relating to the diagnosis of this disease by complement fixation; routes of infection; transmission by contact; filtration experiments; virulence of tissues; thermolability of virus; effect of direct sunlight on virus; cross-immunity tests—avian pest v. pseudo-fowlpest, avian pest v. Newcastle disease, and Ranikhet disease v. avian pest; curative effect of immune serum; and passive immunization with immune serum are reported in tabular form.

**Vaccine against chicken pox** (*Virginia Sta. Rpt. 1928–1931, p. 49*).—Mention is made of the finding that pigeon pox virus produces a higher degree of immunity to fowl pox than fowl pox virus, and is not followed by the severe systemic reactions nor the decrease in egg production that follows the use of fowl pox virus as a vaccine.

**Are hens susceptible to infection with the bacillus of Johne's disease (para-tuberculosis)?** T. van Heelsbergen (*Jour. Compar. Path. and Ther., 44 (1931), No. 3, pp. 213–215*).—Experiments reported indicated that full-grown hens are insusceptible to infection with the paratubercle bacillus.

**Intranuclear inclusions in laryngotracheitis of chickens,** O. Seifried (*Science, 73 (1931), No. 1900, pp. 594, 595*).—The author here briefly records the results of a histological study of spontaneous and experimentally produced cases of laryngotracheitis of chickens, and the finding in both of intranuclear inclusions.

**Observations on a disease of fowls due to a filterable virus and associated with leucocytic inclusions,** S. J. Gilbert and G. B. Simmins (*Jour. Compar. Path. and Ther., 44 (1931), No. 3, pp. 157–169, figs. 4*).—The authors have found that the disease of fowls described by Macfie and by Adler (E. S. R., 53, p. 386), which is not uncommon in Palestine, is caused by a filtrable virus. The disease is nearly always associated with leucocytic inclusions. There was found to be a great variation in the virulence of the virus, and the virulence could be raised by rapid passage. A period of immunity was found to follow both acute and mild attacks. Native flocks are at times susceptible to acute outbreaks of the affection.

**Fowl paralysis,** A. E. Tomhave and C. W. Mumford (*Delaware Sta. Bul. 172 (1931), p. 25*).—Thirty-seven birds from flocks containing cases of paralysis were brought to and kept confined in an isolated laying house with 9 thrifty pullets, 9 unthrifty pullets, and 6 hens, all from the station flock, for a period of 6 months. Of the birds showing symptoms of paralysis, 71.4 per cent had off-colored eyes, 73.3 per cent died within the 6 months' period, and 6.6 per cent showed an apparent recovery. Of the pullets from the station flock none developed paralysis when placed in close contact with birds showing symptoms of paralysis. The laying ration used and the system of management had no apparent beneficial effect upon birds affected with paralysis.

**A study of immunity or resistance to Ascaridia lineata (Schneider),** R. E. Rebrassier and B. R. McCrory (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 3, pp. 349–358*).—In cooperative work by the Ohio Experiment Station and the Ohio State University, an experiment was conducted with 144 chickens to determine if the administration of an extract of the nematode *A. lineata* would increase their resistance to this parasite. These 144 birds were divided into three equal groups according to age, group A containing birds 46 days old, group B 97 days old, and group C 131 days old. Each group was divided into three lots of 16 birds each.

The greatest variation in the average gain per bird was found in group A; the most gain taking place in control birds. The lot receiving extract and ova made a greater gain than the lot receiving only ova. Similar gains were made in group B, but the difference was not so marked. A greater variation in the average amount of feed consumed was observed in group A. The parasitized birds of groups A and B did not consume so much feed as did the controls. An enteritis was present in a majority of the birds in lot 2, group A, which received only embryonated ova, while in lot 1, which received extract and ova, only a small number showed this condition and it was of a milder type. In lots 1 and 2, group B, similar results were observed, but there were not so many affected as in group A. In group C this factor was not significant. No birds in control lots showed this condition. The birds in lot 1, group A (extract and ova), contained a greater number of worms than was found in lot 2, which received only ova, and the average length was about the same in each lot. There was no significant difference in this respect between these two lots in groups B and C.

**Ornithostrongylus quadriradiatus in squabs,** A. Komarov and F. R. Beaudette (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 3, pp. 393, 394*).—In a study by the New Jersey Experiment Stations, the etiological agent of an epizootic of pigeons in which all but six succumbed was found to be a nematode worm identified as *O. quadriradiatus*.

**A new species of nematode worm from the sage grouse,** E. E. Wehr (*U. S. Natl. Mus. Proc., 79 (1931), Art. 3, pp. 3, figs. 3*).—Under the name *Habronema urophasiana* the author describes a new species of nematode found parasitic in the gizzard of the sage grouse (*Centrocercus urophasianus*) at Miles City, Mont.

**Epizootic encephalitis of foxes, II, III** (*Amer. Jour. Hyg., 13 (1931), No. 1, pp. 201–223, figs. 7; 14 (1931), No. 2, pp. 353–373*).—Part 1 of these studies has been noted (E. S. R., 64, p. 566).

II. *General consideration of fur-range epizootics*, R. G. Green.—It appears that fox encephalitis, with a slow rate of spread, may be present endemically among foxes in pens. "When groups of these foxes are run together in fur ranges, the disease increases to a violent epizootic. Any large group of apparently healthy foxes from an endemic focus appears to develop an epizootic indicating that carriers of the disease are common. The epizootic may appear in from 4 to 6 days after common exposure and reach a peak in from 2 to 3 weeks. The mortality in young foxes less than 10 months of age is about two and one-half times greater than that in adult foxes over a year and a half old. The mortality in young foxes appears to average 12.5 per cent of the population when based on known losses and becomes 18.5 per cent when approximated to include mutilated and missing foxes. The corresponding mortality figures for adult foxes are 3.5 per cent and 8.5 per cent. Individual ranch group mortalities as high as 40 per cent of the group population occur. In several groups of foxes studied which have common ancestors, susceptibility to the disease appears uniform. Significant variations in the mortality of whole range groups and of ranch groups in the same range epizootic occur. Evidence points to fur-range conditions and organizations as responsible for these mortality variations. This indicates that rapid variations in the virulence of the virus occur in fur-range epizootics."

III. *Experimental transmission*, R. G. Green, N. R. Ziegler, E. T. Dewey, and J. E. Shillinger.—Epizootic encephalitis of foxes was transmitted to experimental animals from foxes dying in epizootics occurring in two successive years.

"The inoculation of brain and spinal cord virus by cisterna puncture into foxes raised under quarantine conditions has been found to be a successful means of maintaining the encephalitis virus. In the experiments here reported virus stored in 50 per cent glycerine 5.5 months appears to have the same pathogenic properties as does fresh virus.

"Intramuscular injection of brain virus appears to transmit the disease almost as uniformly as does inoculation by cisterna puncture. The spleen of a fox dying of the experimental disease is very active in transmitting the infection to young foxes by cisterna puncture. The disease has also been transmitted by the injection of spleen virus into the peritoneal cavity. The virus has been demonstrated in the heart blood of a fox dying of the experimental infection. We have failed to transmit the disease to five foxes by corneal scarification, even though the scarification was thorough and an experimental virus known to be virulent was used. The disease has also been transmitted to young experimental foxes by skin scarification, by intratesticular injection, and by inoculation of the nasal cavity. While the mortality of the natural disease seldom appears to exceed 20 per cent of those exposed, the mortality of experimentally inoculated young foxes is approximately 70 per cent."

**How to detect the parasites of fur-bearing animals**, W. A. Riley and R. O. Christenson (*Minn. Univ. Agr., Ext. Pamphlet 18 (1931), pp. 22, figs. 19; also in Amer. Fur Breeder, 3 (1931), No. 12, pp. 4, 6, 8, figs. 3; 4 (1931), No. 1, pp. 4–8, figs. 16*).—Methods of study are described.

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations at the Arkansas Station]** (*Arkansas Sta. Bul. 268 (1931), pp. 12–15*).—Cotton machinery studies, by D. G. Carter, involving the use of the tractor as a power unit in cotton production, showed that all operations except hoe work and picking can be performed with approximately 8 man hours per acre. The cultivation time requirement was found to vary directly with the capacity of the power unit. Chopping and hoeing were apparently not affected by the type of equipment used, and the labor required amounted to 32.35 man hours per acre for the crop.

Field studies by Carter, conducted cooperatively with the U. S. D. A. Bureau of Agricultural Economics, on the utilization and cost of farm power led to the general conclusion that a considerable increase in effectiveness could be gained in cotton production by the greater use of 2-horse teams and the use of tractors for more operations with machines of larger capacity.

Post-preservation studies, by Carter and J. B. Woods, showed that creosote and water-soluble salts are reliable preservatives. Oil, sulfur, and spray solutions were not so effective, although there was some gain in durability. Service tests of vineyard fence posts showed that after eight years commercially creosoted round pine posts were sound, galvanized steel posts were in good condition, and painted steel posts were sound but rusted.

An underground water survey in the Grand Prairie area reported by Carter showed that there has been a gradual lowering of the ground water level from which water has been drawn for rice irrigation, which, in some areas, has amounted to from 20 to 35 ft. It is generally concluded that the safe yield of the water-bearing beds has been and is now being exceeded.

Preliminary studies of the water cooling of milk and cream, by Carter and Woods, indicated that milk at from 85 to 90° F. can be reduced to 65° in 3 hours by the use of well water in milk-cooling tanks. The temperature of well water in northwestern Arkansas was found to average 59°. It also was found that milk can be kept in a condition suitable for all sweet milk purposes for 12 hours and is acceptable for cheese factory use for 24 hours.

**[Agricultural engineering investigations at the Virginia Station]** (*Virginia Sta. Rpt. 1928–1931, pp. 58–60, fig. 1*).—In studies of tractor cultivation of row crops, trials of the rotary hoe for the cultivation of corn indicated that this implement was adapted to the earlier cultivations of corn because it moved rapidly and damaged the plants no more than does the ordinary row cultivator. The hoes should be sufficiently spaced to prevent the wedging of stones or sticks between the hoes. In corn cultivation in a field containing old stumps, the old style rigid-frame hoe passed over the stumps with greater ease than did the new flexible-frame hoe, but in doing so left more land untilled. The flexible-frame steel hoe adapts itself more easily to the irregularities of topography. The damage to the crop was small with either hoe. The best work is done with hoes operated at a speed of 3 miles per hour.

In plowing tests it was found that the one-way plowing disk and the so-called "Big-Bill" plowing disk are not desirable where deep plowing is required for corn on rolling topogrophy. The pulverator was very satisfactory for this purpose.

Tests of the combine for harvesting grain and soybeans under Virginia conditions, made in cooperation with the U. S. D. A. Bureau of Public Roads, showed that the combine harvested rye and wheat satisfactorily at a total cost of $3.10 per acre, which is a saving of about $1.50 per acre over the usual binder and thresher method.

In harvesting soybeans, the combine gave an average loss of only 11.5 per cent of the seed as compared with a loss of about 35 per cent when soybeans are harvested with row harvesters or cut with a mower. Mechanical features which were found desirable to adapt the combine to Virginia conditions for harvesting soybeans were (1) a flexible or floating cutting-bar capable of cutting within 4 in. of the ground, (2) a cylinder speed reduction to 450 or 500 r. p. m. to prevent excessive splitting of beans, and (3) keeping the separating mechanism at normal speed.

Tests of the general-purpose tractor in the cultivation of corn, potatoes, and other crops showed that desirable features of a tractor cultivator include (1) flexibility in both lateral and longitudinal directions for successful operation on rolling, hilly, terraced, and irrigated land, (2) easy attaching and detaching of cultivator from tractor, (3) provision for cultivating tractor-wheel tracks, (4) ability to control tractor and cultivator with steering gear alone, and (5) ability to lift cultivator with one lever.

**Tests of spray irrigation equipment,** F. E. Staebner (*U. S. Dept. Agr. Circ. 195 (1931), pp. 30, figs. 28*).—The results of tests of typical German and American spray-irrigation equipment to determine the uniformity of the water distribution over the surface are reported, and the methods of testing and the experimental apparatus are described.

Results indicate that more uniform distribution over a large area can be obtained with the overhead-pipe system than with any other type of spray-irrigation equipment now available. This is due to the fact that each unit wets an approximately rectangular area and when properly handled will wet it quite uniformly. Furthermore, the areas irrigated by adjacent units join without serious overlaps or gaps.

Some merit was established for the German idea of a sprinkler intended to wet a square area. However, the two types of square spray nozzles tested failed to accomplish this aim to an extent that their introduction into this country is not deemed warranted. The distribution accomplished by two of the circular sprinklers was reasonably uniform, but under most of them it was very poor.

**Elimination of taste in water passing through creosoted wood stave pipe,** J. F. Harkom and C. Greaves (*Engin. Jour., 14 (1931), No. 10, pp. 515–517, figs. 3*).—In a contribution from the Forest Products Laboratories of Canada the results of an investigation are presented as to the probable outcome of passing potable water through a very long pipe line of creosoted wood stave construction. These show that filtration tests should be continued to determine the cost of using activated carbon, since there does not appear to be any prospect of obtaining satisfactory taste removal by superchlorination followed by dechlorination.

**Testing of fire resistance of building materials.—I, Brick walls** [trans. title], R. Schlyter (*Statens Provningsanst., Stockholm, Meddel. 50 (1931), pp. 62, figs. 35; Eng. abs., pp. 56–62*).—The results of tests of the fire resistance of brick walls are reported, and the laboratory building, furnaces, and test methods are described.

The fire laboratory is a building about 13 meters long, 8 meters wide, and 4.5 meters high and consists of a furnace room and extinguishing room. It is connected with a heat-insulation and refrigeration laboratory of the same width, 11 meters long, and 3.5 meters high.

The vertical fire-testing furnace consists of a combustion chamber closed in front by the testing frame with the wall being tested and surrounded on both sides by five chambers filled with fireproof brick macadam. On the two walls at each end of the combustion chamber there are 21 gas burners. The horizontal fire-testing furnace has a horizontal combustion chamber 2 meters wide, 4.5 meters long, and 0.35 meter high. The bottom of this chamber consists of fire-clay bricks laid flat so as to cover horizontal channels running parallel to the short sides of the furnace. There are 9 gas burners on each of the long sides, thus making 18 burners with compressed air from the fresh air fan used in the fire laboratory for both the vertical and horizontal furnaces.

In the fire testing, a wall 3 meters high and 2 meters wide is inserted into the testing frame and subjected to a hydraulic load equal to that which it will carry in a building. It is placed in front of the furnace room, which is heated with gas to a high temperature. In this manner the wall is heated to the desired temperature, and then the heated side is sprayed with water. The horizontal furnace is used for testing beams or other horizontal structures.

The test results with brick walls showed that bricks which had not been sprayed with water did not show other damage than that the surface parts which were exposed to the fire were fused. There was no great spalling or cracking of the surface parts when the bricks were sprayed with water after being fire tested for 4 hours or less. It is concluded that in tests not exceeding 4 hours the damage to brick is restricted to the surface parts. Tests of a sand-lime brick wall showed that the wall was in good condition after an 8-hour fire test and water application. A silurian brick wall gave the same results in tests as the sand-lime brick wall. The damage which occurred in a wall of hollow cement tile after a 1-hour fire test consisted chiefly of spalling on the exposed side alongside the cavities. The surface parts of a cinder-concrete wall which were destroyed after being subjected to a 4-hour fire test were washed away to an average depth of 3 cm. The material of the slabs was hard and solid at a greater depth.

During the actual fire test, loaded walls expanded vertically and deflected toward the fire. It also was found that moisture content greatly influenced the rise in temperature and the extent of the damage. Plastering apparently did not afford any protection to wall surfaces.

**Effect of temperature on the corrosion of zinc,** G. L. Cox (*Indus. and Engin. Chem., 23 (1931), No. 8, pp. 902–904, figs. 2*).—Studies conducted at the Massachusetts Institute of Technology are reported, the results of which indicate definitely that the corrosion rate of zinc in oxygenated distilled water over a range of temperature is controlled largely by the nature of the corrosion products film, rather than the temperature coefficient of the specific reaction rate of the corrosion process, the rate of transfer of oxygen through the liquid, or the oxygen solubility.

**House painting methods with the brush and spray gun,** F. N. Vanderwalker (*Chicago: Frederick J. Drake & Co., 1930, pp. 382+[4], pl. 1, [figs. 142]*).—This book deals with methods, materials, and tools essential to the painting of exterior surfaces of wood, metal, brick, and cement. It contains chapters on a survey of the market; brushes for painters and decorators, description, uses, and care; mechanical spray painting equipment; ladders, scaffolds, and swing stages; miscellaneous painters' tools; painter-mixed house paints; tinting colors and their use; factory ready-mixed paints; paint oils, thinners, driers, and removers; metal paints and painting; cement and brick paints and painting; a study of woods and surfaces; estimating material required; a job of painting with the brush; painting with the spray gun; exterior stains and staining; painting defects, causes, and remedies; the paint shop; and oxidizing copper surfaces.

**Effect of resin in longleaf pine on the durability of house paints,** F. L. Browne and C. E. Hrubesky (*Indus. and Engin. Chem., 23 (1931), No. 8, pp.*

*874–877*).—Studies conducted at the U. S. D. A. Forest Products Laboratory are reported in which it was found that the behavior of coatings of house paint on well-seasoned boards of longleaf pine does not vary appreciably with the amount of resin visible in or extractable from the boards. The density of the wood and the width of its annual growth rings, on the other hand, were found to exert a marked effect on the durability of paint coatings.

**Paint thinners, I, II** (*Indus. and Engin. Chem., 23* (*1931*), *Nos. 8, pp. 868–874, figs. 2; 11, pp. 1214–1220, figs. 8*).—Part 1 reports studies conducted at the U. S. D. A. Forest Products Laboratory and part 2 tests conducted at the Mellon Institute of Industrial Research.

I. *Effect of different thinners on the durability of house paints in outdoor exposure tests*, F. L. Browne—Exterior exposure tests at five stations made with two types of house paint on longleaf pine showed that variations in serviceability of coatings, caused by the nature of the volatile liquid with which the paint is thinned, are much less important than such factors as the pigment composition of the paint or the physical character of the wood painted.

Turpentine tends to make paint coatings more durable in proportion to the amount of residue it leaves permanently in the coating. When gum-spirits turpentine was oxidized by heating and aerating and then used as a paint thinner, the durability was definitely improved. Steam distilled and destructively distilled wood turpentines meeting current specifications were found to be as acceptable as gum-spirits turpentine for thinning house paint. It also was found that the type of crude oil from which mineral spirits is refined does not affect the durability of paint coatings. Varnish makers' and painters' naphtha, which evaporates more rapidly than mineral spirits, seems to make paint coatings more durable. It is suggested that the greater speed of evaporation leaves less time for the pigments to settle in the fresh coating and therefore results in more uniform dispersion of the pigments in the hardened coating. Solvent naphtha from coal tar was found to have no advantages over turpentine or petroleum distillates as a paint thinner.

II.—*Results of accelerated weathering tests of white house paints reduced with different types of thinners*, H. K. Salzberg, F. L. Browne, and I. H. Odell.—With paints applied to groups of white-pine and southern yellow-pine panels, it was found that ordinary turpentines contribute slightly more to the durability of paint coatings than do mineral spirits, regardless of the type of crude oil from which the mineral spirits is obtained or its content of saturated and aromatic hydrocarbons.

In thinning paints of which zinc oxide is a component, slightly more turpentine than mineral spirits may be added to reach the same consistency. Checking of coatings of straight white-lead paint on southern yellow pine did not appear so soon when the thinner was an oxidized turpentine as it did when the thinner was ordinary turpentine, or a petroleum or coal-tar distillate. The initial gloss of the coatings, the rate of loss in gloss, discoloration by yellowing of paint oil, the rate of chalking, and the exudation of resin were not affected by the choice of paint thinner.

It was found that the ratio of oil to thinner in the paint mixture can be varied within wide limits without appreciably affecting the durability of paint coatings on white pine.

**New methods of testing fertilizer distributors**, F. Keeble (*Jour. Min. Agr.* [*Gt. Brit.*], *37* (*1930*), *No. 5, pp. 439–451, pls. 4, fig. 1*).—Methods of testing fertilizer distributors are described from the English viewpoint, and trials conducted with four different types of fertilizer are reported. The factors considered in the trials were evenness of distribution, laterally and longitudinally;

material, durability, and workmanship; ease of dismantling and cleaning; accuracy of calibration; ease of adjustment; and lightness of draft. The data obtained are discussed in considerable detail.

The results in general indicate the desirability of incorporating in the design of fertilizer distributors lightness combined with strength and a positive measure for the feed. The discharge of the fertilizer should be close to the ground, and parts working in the fertilizer should be avoided. Better lubrication of moving parts should be incorporated, and a good quality of protective covering is required on the metal construction.

**Some engineering phases of fertilizer application experiments,** G. A. CUMINGS (*Agr. Engin., 12 (1931), No. 9, pp. 351, 352*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering the plan of the fertilizer placement studies is briefly outlined.

**Machinery for weed control,** E. A. HARDY (*Agr. Engin., 12 (1931), No. 10, pp. 369–373, figs. 10*).—In a contribution from the University of Saskatchewan, weed control methods applicable particularly to the wheat lands of Canada are described. It is pointed out that an enormous amount of power is required to control adequately the weeds of the spring wheat area, and that several machines of special design are desirable for weed control purposes. It has been found that all machines of this character should be sharp and in good adjustment, and that consideration must be given to the problem of soil drifting as well as weed control when selecting the machine.

**Factors influencing power demands of electric-motor-driven threshers,** T. E. HIENTON (*Agr. Engin., 12 (1931), No. 9, pp. 357, 358, figs. 2*).—After briefly reviewing experiments at different places on the uses of electricity in threshing, the results of experiments conducted at the Indiana Experiment Station are reported in which a 20 by 32-in. thresher was operated by a 10-h. p. single-phase motor. The capacity of the machine was from 40 to 80 bu. of wheat per hour. An average overload of 24 per cent was experienced in threshing wheat at the rate of 48.8 bu. per hour, and 14 per cent in threshing oats at the rate of 88.9 bu. per hour. In threshing soybeans the cylinder speed was reduced from 1,080 to 720 r. p. m., and the average power output of the motor exceeded its rating by 11 per cent while threshing at an average capacity of 42 bu. per hour.

Further threshing tests indicated that lowering stacker fan speeds reduced the power requirements, and that the variation in power demands caused by changing the speed of the cylinder is not significant. The limit of reducing the speed of the stacker fan was reached in threshing wheat at 755 r. p. m.

**Artificial curing of green hay** [trans. title], H. EDIN, N. BERGLUND, and Y. ANDERSSON (*K. Landtbr. Akad. Handl. och Tidskr., 70 (1931), No. 6, pp. 845–947, figs. 11; Eng. abs., pp. 938–947*).—In a contribution from the animal husbandry department of the Government Experiment Station of Sweden, made in cooperation with the Swedish Association of Agricultural Engineering, investigations concerning the nutritional and technical problems in the preservation of green forage are reported.

In the artificial drying experiments, apparatus was used consisting of a heat generator with a spark collector, a fan for blowing the drying gases, a rotary kiln, a machine for cutting the fresh material, a forage grinder, and electrical apparatus. The heating unit was built of brick as a vertical furnace and was adapted for burning cheap firewood. The furnace gases were mixed with fresh air until the temperature desired was reached, and the mixture was blown by the fan into the drum. The kiln drum had a drying chamber in the center, around which were canals separated from the center by locked sheet iron. The gases were blown into the lower canals and from there into the locked sheet iron and through the green hay. The material was mixed by the rotation of the drum, but is was found that the uniformity as well as the speed of drying was dependent on the character of the material. Loose material dried more readily than more compact material. The capacity of the plant was from 550 to 620 kg. (1,210 to 1,364 lbs.) of fresh material per hour. At a temperature of the gases of 350° C., the wood consumption was about 0.5 kg. per kilogram of water evaporated and from 1.5 to 3 kg. per kilogram of dried product.

Descriptions also are given of various other methods of drying hay artificially, including the open tray and endless conveyor methods. It was found that the most rapid and uniform drying is obtained by methods which allow all the grass particles to be suspended in the combustion gases while these are blown through pipes or canals. If the material is sufficiently ground and the temperature is high, grasses can be dried by these means in a few seconds.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**[Investigations in agricultural economics at the Arkansas Station, 1930–31]** (*Arkansas Sta. Bul. 268 (1931), pp. 64–69*).—Investigations not previously noted are reported as follows:

Average taxes in 1930 on 399 farms studied by C. O. Brannen were $66, as compared with $64 in 1929 and $71 in 1928. In 1930 only 29.7 per cent of the farms showed any net returns, as compared with about 92 per cent in the two preceding years. The average net return for all the farms in the study in 1930 was —$42.

A study by E. P. Dargan, in cooperation with the U. S. Department of Agriculture, showed that the average cost of producing grapes on 78 farms in 1929 was $59 per ton and the average price received $46 per ton. The average cost in vineyards yielding 2 tons or more per acre was $41 per ton.

A table by Brannen shows for 1928–29, 1929–30, and 1930–30 Arkansas upland cotton crops the percentage distribution by grades, staple length, and tenderability on future contracts.

**[Investigations in agricultural economics at the Delaware Station, 1930–31]** (*Delaware Sta. Bul. 172 (1931), pp. 7–10*).—Results of investigations not previously noted are reported as follows:

Using the index based on salary of primary school teachers, salary of secondary school teachers, proportion of children attending and those of school age not attending private and parochial schools, number of pupils per teacher, evenness of distribution of children among grades of public schools, and value of school buildings and equipment per pupil enrolled, the rank of Delaware in 1922, 1926, and 1928 among the States in the support given schools was determined and compared with the ranks determined by the Ayres and Phillips index numbers. The ranks for the respective years were as follows: Delaware index, 33, 28, and 24; Ayres index, 30, 23, and 32; and Phillips index, 34, 22, and 31.

A study by M. M. Daugherty of the costs of county government showed that highway expenditures constituted more than 50 per cent of the budget; expenditures for correction of both adults and minors, neither of which can be controlled by the levy courts, increased faster than any other types of expenditures except those for roads; and expenditures for general government increased relatively at a less rate than those of any other major function of government.

A study by R. O. Bausman of farm tenure, based on 900 labor income records and approximately 200 personal history records each for landlords and tenants, showed that during the past 30 or 40 years good tenants in the State have decreased, due to better opportunities for alternative employment, and that the good tenants have shifted to larger farms, to higher acre value farms, and to farms better located as to markets and hard surface roads.

**Mechanization of agriculture as a factor in labor displacement** (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 33 (1931), No. 4, pp. V, 1–35*).—This article "reviews the history of agriculture in the United States from the standpoint of mechanization and attempts to measure the effects of mechanical changes upon the employment of labor."

**Farm power utilization and costs, South Carolina,** B. A. RUSSELL (*South Carolina Sta. Bul. 280 (1931), pp. 43, figs. 13*).—This bulletin reports the results of a study made in cooperation with the Bureaus of Agricultural Economics, Animal Industry, and Public Roads, U. S. D. A., of 27 mule farms averaging 255 acres in crops and 22 tractor farms averaging 394 acres in crops in the Coastal Plains region, and 22 mule farms averaging 149 acres in crops and 20 tractor farms averaging 279 acres in crops in the Piedmont area. It is based on a complete record of farm operations for the farm year 1929. Tables are included showing for each section for the average, above average, and below average size farms of each type the utilization of land, investment in power and equipment, and the costs by items of mule power and of tractor power. Other tables show the amounts and costs of man labor and of mule or tractor power, cost of machinery, and total costs of flat-breaking land, harrowing, drilling oats, cutting small grain, threshing small grain, cutting cowpea hay, and baling oat straw and cowpea hay, using different types of equipment and power.

The average cost of tractor power was $1.05 per hour in the Coastal Plains and 84 cts. in the Piedmont region. The cost per tractor used from 1 to 3 years averaged 68 cts. per hour, and that for tractors from 4 to 8 years old 96 cts. Ownership of a tractor in either area did not appear to be justified unless the tractor could be used from 50 to 75 days each year during its useful life.

The data indicated that harvesting small grain with a combine reduced the expense at least 4 cts. per bushel from that of the binder and stationary thresher method.

**An analysis of Mississippi River traffic, 1918–1930,** J. D. SUMNER (*Jour. Land and Pub. Util. Econ., 7 (1931), No. 4, pp. 355–366, figs. 5*).—This article discusses the volume, character, and value of the traffic on the river, the length of haul, growth of the Federal barge line traffic, the freight interchanged with railroads, concentration of traffic at large centers, long-distance shipments, and the northbound tonnage and traffic balance. The river traffic, while relatively small as compared with that of railroads, has shown much growth since 1918 and is now substantially in excess of that of any period in the last 40 years. It is not confined to a few low-value, bulky, raw materials, but has an average per ton value comparable to that of railroads. Freight interchange with railroads has developed rapidly until the major portion of the barge line freight is so handled. The northbound traffic includes more than half of the barge line freight, and economical operation now requires further development of downstream traffic.

**Financial operations of Ohio farmer owned elevators during the fiscal year 1930–31,** B. A. WALLACE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 43 (1931), pp. [1]+15*).—This is a continuation of the study previously noted (E. S. R., 65, p. 386). It is based on an analysis of the principal balance sheet and income and expense items of 151 companies operating 180 plants and detailed analysis of the expenses of 50 of the companies, commodity sales and margins of 27 companies, and monthly accounts receivable of 17 companies from January, 1925, to December, 1930, inclusive.

**Wisconsin dairy statistics,** W. H. Ebling, S. J. Gilbert, and G. T. Gustafson (*Wis. Dept. Agr. and Markets Bul. 120* (*1931*), *pp. 136, figs. 126*).—This bulletin, prepared by the Wisconsin Department of Agriculture and Markets and the U. S. D. A. Bureau of Agricultural Economics, includes statistical summaries and historical sketches of the dairy industry in Wisconsin and the United States and a brief summary of the world dairy situation.

**Correlation and machine calculation,** H. A. Wallace and G. W. Snedecor, rev. by Snedecor (*Iowa State Col. Off. Pub., 30* (*1931*), *No. 4, pp. 71, fig. 1*).—This is a revision of the publication previously noted (E. S. R., 56, p. 330). Some methods of Fisher[3] for testing the significance of the various correlation statistics have been adapted. The explanations have also been amplified, and a considerable amount of illustrative matter has been added.

**Stability in questionnaire response,** R. Bain (*Amer. Jour. Sociol., 37* (*1931*), *No. 3, pp. 445–453*).—The answers to the same questionnaire submitted to the same 50 college freshmen—30 male and 20 female—with a period of 2.5 months intervening are compared. The questionnaire included 19 factual family items, 17 factual personal items, and 25 subjective personal items. The percentages of changes in answers for the males were for factual family items 30, factual personal items 22, and subjective personal items 26, total 26. For the females the percentages were 23, 12, 22, and 19, respectively. The possible explanation of changes and the variations in individual items are discussed briefly, and a number of methodological questions are raised and some suggestions made for further research.

**Proceedings of the Fifth New England Institute of Cooperation** (*[Orono, Me.: A. L. Deering, Sec.], 1931, pp. [3]+109*).—Included are a list of the persons attending and the following papers read at the meeting held at Orono, Me., June 23–25, 1931: A Production Program for the New England Dairy Industry, by W. H. Bronson (pp. 2–6), by I. G. Davis (pp. 7–9), and by D. W. Reed (pp. 10–12); Tendencies Towards the Concentration of Control in the Dairy Industry Throughout the United States and Necessity for a Single Price-Making Agency in Each Milkshed, by C. E. Hough (pp. 13–19); A Price Rating System for All New England Dairy Products, by W. P. Davis (pp. 20–27); An Organization to Meet New England Milk Marketing Problems, by H. P. Young (pp. 28–30); The Farm Board and Dairy Marketing, by W. F. Schilling (pp. 31–38); Reducing Feed Distribution Costs, by Q. Reynolds (pp. 39–46); Relationship of Different Agencies in the Farm Marketing Program, by F. V. Waugh (pp. 47–50); The New England Farm Marketing Program—from the viewpoint of a marketing official, by D. J. Curran (pp. 51–54), from the viewpoint of a research worker, by R. B. Corbett (pp. 55–57), from the viewpoint of an extension worker, by H. B. Rowe (pp. 58, 59), and from the viewpoint of a label user, by F. R. Hazard (pp. 60, 61); The Future of the New England Farm Marketing Program, by I. G. Davis (pp. 62–66); What Consumers in Northeastern United States Want for Potatoes, by F. G. Robb (pp. 67–72); Distribution of Maine Potatoes, by C. D. Wilder (p. 73); The Perishable Agricultural Commodities Act, 1930, by F. G. Robb (pp. 74–87); Whither Is American Agriculture Tending? by L. S. Tenny (pp. 88–90); Inspection, Grading, and Branding Potatoes, by W. E. Woodman (pp. 91, 92); A Cooperative Set-up for Marketing Maine Potatoes, by W. R. Thompson (pp.

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[3] Statistical Methods for Research Workers, R. A. Fisher. Edinburgh: Oliver & Boyd, 1930, 3. ed., rev. and enl., pp. XIII+283, figs. 12.

93–95); Factors Affecting Price of Maine Potatoes, by L. H. Bean (pp. 96, 97); Future Trading in Potatoes, by L. S. Tenny (pp. 98–102); and Potato Tour of Areostook County, by M. D. Jones (p. 103).

**American standards and planes of living,** edited by T. D. ELIOT (*Boston and London: Ginn & Co., 1931, pp. XII+931, figs. 12*).—This is a series of readings in the social economics of consumption grouped under the following headings: The general significance of standards of living, actual planes and standards of living illustrated; the relativity of group standards and of individual standards; standards of living in the economic process—the economics of consumption; the basis of community standards in natural resources; the struggle for standards—wages and the standard of living; home economics and the standard of living; the appraisal of luxuries; family budgets in relation to standards of living; thrift, the standard of living, and the birth rate; threatened standards; changes in standards; the maintenance and defense of community standards; standards of life as scales of value and tests of progress; standards for the future community; and conclusions including articles on Community Standards as Social Conservation, by E. T. Devine (pp. 889–891), Community Standards as a Guide to Social Efficiency, by M. K. Simkhovitch (pp. 891–895), and Prospects and Responsibilities, by E. T. Devine (pp. 895–897).

The following apply especially to rural conditions: Developing Standards of Rural Child Welfare, by G. Abbott (pp. 142–145); Spending the Dollar Wisely in Home and Community, by C. J. Galpin (pp. 415–420); The Family Budget as a Tool for Sociological Analysis, by C. C. Zimmerman (pp. 488–500); Family Budgets and Wages, by M. L. Stecker (pp. 500, 501); Changing Rural Standards (pp. 705–707) and Where Does the Farmer Get the Standard by Which He Measures His Life and Living (pp. 878–881), both by C. C. Taylor; and Better Living on the Farm, by H. C. Taylor (pp. 882–887).

**Village and open-country neighborhoods,** W. A. TERPENNING (*New York and London: Century Co., 1931, pp. XXIV+493, pls. 32, figs. 15.*)—This is a comparative study of village and open-country neighborhoods made in search of suggestions for the aid of rural students and organizers in directing the reorganization of American rural neighborhoods. The several chapters deal with the significance of primary groups, the life study method, the history of neighborhoods, the American neighborhood, the Swiss commune, the English parish, the German dorf, the French commune, the Italian commune, the Irish neighborhood, the Danish sogn, and the Russian mir. A bibliography (pp. 463–490) is included.

**Rural housing** (*Virginia Sta. Rpt. 1928–1931, p. 70*).—This is a study of the housing of 255 white families and 195 colored families in Virginia. Of the houses of the white families, 28 per cent were in excellent or good condition and 25 per cent in poor or very poor condition. Of the houses of the negro families, only 4 per cent were in first-class condition and 46 per cent in poor or very poor condition. In both classes there were more than 2 persons per bedroom in approximately 50 per cent of the families, and from 5 to 8 persons in about 6 per cent of the families. Lack of heating, rather than smallness of the houses, was responsible for this condition in some instances.

## FOODS—HUMAN NUTRITION

**Composition of dried California prunes of the French (Prune d'Agen) variety,** L. GALE and W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 10 (1931), No. 10, pp. 302–304*).—Analyses are reported of 13 samples of dried prunes of the French (Prune d'Agen) variety, 1930 season, obtained from packing houses in the three most important prune-growing sections of California. Sugar was determined by the Shaffer-Hartmann copper reduction volumetric method and the other analyses by the Official methods.

The locality where the fruit was grown appeared to affect the composition more than the size of the fruit. When calculated to a common moisture basis, the total sugar content of the Santa Clara Valley prunes was definitely and consistently higher than that of samples from the other two districts. The content of total soluble solids was highest in the samples from the San Joaquin Valley and the acidity and ash in the Sacramento Valley samples. There was very little difference in the composition of the ash in the samples from the three localities. The average composition calculated to a common moisture content of 7 samples from Santa Clara and 3 each from the Sacramento and San Joaquin Valleys was as follows: Pits 14.75 per cent, moisture 18.36, total soluble 77.97, total sugar as invert 46.78, sucrose 3.37, invert sugar 43.93, protein 2.79, total acid as citric 1.20, ash 2.19, water-soluble alkalinity of ash 20.46, acid-soluble alkalinity of ash 7.30, and total alkalinity of ash 25.15 per cent.

Average values for the more important ash constituents in percentage of total ash were for phosphorus pentoxide Santa Clara 10, Sacramento 10.6, and San Joaquin 10.02 per cent, for CaO 3.93, 4.69, and 3.26 per cent, respectively, and for iron 0.41, 0.3, and 0.7 per cent, respectively.

**The effect of desiccation upon the nutritive properties of egg-white, II,** M. A. B. FIXSEN (*Biochem. Jour., 25 (1931), No. 2, pp. 596–605, figs. 2*).—This paper reports an extension of the investigation of Boas, noted previously (E. S. R., 57, p. 788), undertaken in an effort to explain the action of the hypothetical factor X in counteracting the harmful effects of dried egg white when used as the sole source of protein in a diet for young rats. Two alternative hypotheses were tested: (1) That dried egg white is lacking in some essential dietary factor which is supplied by the protective factor X, and (2) that a toxic substance is formed in dried egg white as a result of desiccation and neutralized in some way by the protective factor X.

Various purified protein fractions of egg white were substituted for the harmful dried egg white after the characteristic symptoms had appeared. With crystalline ovalbumin there was a rapid improvement in the condition and in growth. This was thought to prove that the symptoms caused by the ingestion of dried egg white are caused not by a deficiency of some dietary essential but by the presence of some toxic substance. In the hope of determining from which of the constituents of the egg white the toxic substance was derived, some of the other proteins in egg white were tested in the same way, with the conclusion that the nonprotein fraction rather than any of the proteins is responsible.

Further study of the protective factor showed that it is present in raw liver and in a dried preparation of the total albumin and ovomucoid fraction of egg white, but not in raw beefsteak. It is present in casein and is not removed from it by repeated washing with dilute acetic acid, followed by extraction with hot alcohol. Only a small fraction of the protective factor could be extracted from fresh washed yeast by boiling in dilute acetic acid. These observations are thought to prove that the factor is not identical with any of the members of the vitamin B complex, although probably closely allied to them.

Some of the rats showing characteristic symptoms when fed upon dried egg white were cured spontaneously, apparently by refection, as first described by Fridericia et al. for vitamin B (E. S. R., 58, p. 792). It is suggested that the agency is the same in both cases, whether it be the synthesis in the intestines of the protective factor by some organism or the union of the toxic substance with undigested starch.

**Food expenditures and dietary standards** (*Virginia Sta. Rpt. 1928–1931, p. 70*).—This summary states that in a study of the kind, quantity, and cost of food for 74 rural families in the State the average number of persons fed in each household was equivalent to 5.5 adult male units and the cost per year $126 per adult male unit or about $700 per family. About 80 per cent of the food was furnished by the farm. It is considered that the food consumed was adequate in quantity, but inadequate in quality through an insufficiency of fruits and vegetables.

**Raw basic feeding in anorexia of childhood,** I. N. KUGELMASS and E. L SAMUEL (*Arch Ped., 48* (*1931*), *No. 7, pp. 457–462*).—On the theory that "the essential mechanism of digestion primarily depends on mechanical irritation induced by the food ingested," and that loss of appetite in children is "not a problem involving primarily inadequate gastric or duodenal juice or enzymes but rather one of alimentary mechanics," the authors recommend a raw base-forming diet for the initial treatment of such anorexia. A day's menu, with its composition in organic and inorganic food essentials, is given, and clinical observations and metabolic studies are reported of patients maintained on this diet.

**The self-selection of food constituents by the rat,** S. K. KON (*Biochem. Jour., 25* (*1931*), *No. 2, pp. 473–481, figs. 4*).—In the experiments reported the rats were called upon to choose only between three variables, protein, carbohydrate, and minerals. The protein consisted of casein purified by washing with acidulated water, the carbohydrate sucrose, later changed to starch, and the salt mixture McCollum 185. These were offered in separate cups and each animal received daily in addition 2 drops of cod-liver oil fed by hand and 0.25 cc. of an aqueous extract of brewer's yeast equivalent to 0.5 gm. of the dried yeast. Four rats of one litter were offered their choice, and the other 2 were given the same constituents in the form of a mixture composed of 75 parts of sucrose, 25 of casein, and 4 of salt mixture. The experiment continued for 10 weeks, but 2 of the experimental animals died after 54 and 61 days, respectively.

The average protein consumption of the group was only 6.5 per cent. Changing sucrose to rice starch did not affect the intake. The growth increases were very small in comparison with the control group receiving 20 per cent protein. These results did not confirm the conclusion expressed by Mitchell and Mendel, on the basis of the choice of rats and mice between adequate and inadequate food mixtures (E. S. R., 46, p. 758), that "rats and mice make selections which are as a rule advantageous for their nutritive condition."

**The mineral exchanges of man.—I, Organization of metabolism ward and analytical methods,** S. H. BASSETT, C. A. ELDEN, and W. S. MCCANN (*Jour. Nutrition, 4* (*1931*), *No. 2, pp. 235–248*).—This paper describes in detail the technic for a comprehensive study of the simultaneous exchanges of sodium, potassium, calcium, magnesium, iron, nitrogen, and phosphorus in human subjects. A special metabolism ward for this purpose is described, with the technic employed in the collection and preparation of the excreta and the preparation of the food, and the analytical methods selected after many trials as best suited to the purpose are discussed.

Ten different diets are listed, with their composition in raw weights of the various foods included, and in the content of protein, fat, carbohydrate, nitrogen, and the various ash constituents as determined by actual analysis. A comparison of the mineral content by analysis and by calculation from the

Sherman values showed good agreement in the case of iron, magnesium, potassium, phosphorus, and nitrogen, while in the case of sodium the amounts determined were considerably above and of calcium below the calculated values.

**Activity of vitamin concentrates** (*Brit. Med. Jour., No. 3679 (1931), pp. 71, 72*).—A brief summary is given of some of the findings in a series of tests conducted by K. H. Coward, under the authorization of the Council of the British Medical Association, to estimate the vitamin activity of various preparations advertised to contain certain vitamins.

The methods of testing for vitamins A, D, and C are outlined, and the reports are given of the results obtained with four different preparations. Two of the products were tested for vitamin A, with results indicating an activity similar to that of cod-liver oil. Of three products tested for vitamin C, two gave negative results, although the products were advertised to contain this vitamin. It is pointed out that there was no reason to doubt that highly active concentrates of vitamin C had been incorporated in these preparations, but they had undoubtedly disappeared during the process of manufacture.

"Concentrates of most of the vitamins can be produced in the laboratory, and they are fairly stable if kept under ideal conditions. In the case of commercial preparations it would appear that their content of vitamin A only equals that of cod-liver oil in the more favorable cases, and in the case of vitamin C it would appear to be a very difficult problem to produce a commercial preparation which contains any of this vitamin. Evidently it is difficult for the manufacturing chemist even to equal the natural sources of vitamins A and C, and, therefore, it is still advisable for the medical profession to exercise caution before abandoning cod-liver oil and orange juice as sources of these vitamins in infant diets."

**Further observation of the effect of light on the synthesis of vitamins**, V. G. HELLER and R. R. ST. JULIAN (*Jour. Nutrition, 4 (1931), No. 2, pp. 227–233*).—In continuation of the observations noted previously (E. S. R., 58, p. 893), further studies are reported briefly on factors affecting the synthesis of vitamins A and D in plant sources. Wheat seedlings grown in the light were compared for their vitamin A content with similar seedlings after blanching and with etiolated seedlings. The blanched seedlings were found to contain nearly as much vitamin A as the green and much more than the etiolated seedlings. Similarly, the leaves of celery blanched after attaining full growth were found to be nearly as high in vitamin A as green leaves.

To determine the distribution of vitamin A in the growing plant, wheat seedlings were grown in the sunlight until about 2 in. in length, and the same number of whole green sprouts, the green tops only, and the seed remnants were fed to rats as the sole source of vitamin A. In one series of tests the tops proved more effective than the whole green sprouts and in the other nearly as effective, while the seed remnants were ineffective.

Wheat seedlings grown in the sunlight under a glass transmitting waves of 435 to 490$\mu\mu$ and under another transmitting waves of 626 to 720$\mu\mu$ were compared for their vitamin A content. As determined by the gains in weight over a 46-day period of young rats previously brought to stationary weight on a vitamin A-free diet, the seedlings grown in sunlight contained the largest amount of vitamin A, followed by those grown under the glass transmitting short waves, while those grown under the other filter were only slightly less effective.

The conclusions drawn from this series of experiments are that several interrelated factors are active in the synthesis of vitamin A in light, that as the vitamin forms it is stored in the portion of the plant most exposed to light, and that when once formed it is not destroyed along with the color in blanching.

Wheat seedlings grown in the dark, in sunlight, and under the same two glasses as in the vitamin A tests were tested for vitamin D by curative tests on rats rendered rachitic on the Steenbock-Black diet. The rats receiving per rat per day 8 seedlings germinated in sunlight were practically cured in 18 days as determined by X-ray examination. In only one other case, that of the seeds grown under the glass transmitting short waves, was there even partial cure. In a parallel series of experiments with green asparagus, amounts as high as 8 gm. per rat per day were ineffective. Yellow and green beans, yellow carrots, and red beets were without effect as curative agents when fed to the extent of 50 per cent of the ration. It is concluded that vegetables are very poor sources of vitamin D. In explanation of the curative action of the wheat shoots grown in the sunlight, a mild irradiation is suggested.

**The vitamin A and D content of some margarines, D. Fetter and A. J. Carlson** (*Amer. Jour. Physiol., 96 (1931), No. 2, pp. 257–264, figs. 2*).—Determinations are reported of the vitamin A and D content of two margarines, one containing coconut oil and the other oleo oil and lard, and of the latter fortified with a trace of cod-liver oil and a "vitamin concentrate," respectively. Cod-liver oil and a hydrogenated vegetable fat were used for positive and negative controls. The materials were fed at a 5 per cent level.

In the vitamin A studies the diet of Palmer and Kennedy (E. S. R., 58, p. 192) was used, with no depletion period. The growth curves presented show practically no gain on the hydrogenated fat and coconut oil margarine. The rats receiving the oleo oil margarine grew at a rate slightly superior to those on the butterfat for a period of a little over 12 weeks, after which there were fluctuations but without continued gain as on the butterfat. The authors conclude, however, that "fat margarine churned in whole milk is equal to butter in vitamin A content."

In the vitamin D tests, the curative technic of McCollum et al. (E. S. R., 47, p. 566) was used. The coconut oil margarine was apparently not tested. Of 4 rats receiving butter, 2 were given a + score for healing of rickets and 2 a 0 score, while of those receiving the oleo oil margarine 2 received a ++ and 2 a +++ healing score. The authors conclude that the oleo oil margarine tested "is superior to butter in vitamin D content."

**Caseinogen for vitamin tests, K. H. Coward, K. M. Key, F. J. Dyer, and B. G. E. Morgan** (*Biochem. Jour., 25 (1931), No. 2, pp. 551–560, fig. 1*).—This paper, which deals chiefly with a comparison of various caseins obtainable from the British Drug Houses Ltd. as the source of protein in vitamin A-free diets, contains an appendix dealing further with the method described in a previous paper (E. S. R., 65, p. 588) for calculating the vitamin A potency of any material by comparison with a curve relating mean increases in weight to dosage of a standard cod-liver oil. The original equation was obtained from results on groups of rats consisting of approximately equal numbers of males and females. Separate equations have now been developed in the same way for males and females.

Attention is called in a consideration of these curves to the fact that although only 15 animals were used for each point on the curve, the curves are very smooth, indicating that a reliable average can be obtained from that number of animals. It is also noted that the males responded more vigorously than the females to the higher doses of vitamin A, but that the opposite was true for the lower doses. This raised the question of the relative mortality of males and females, and it was found that of 288 males which had been used in testing various doses of cod-liver oil, 57, or 19.8 per cent, had died, while of 277 females, 37, or 13.4 per cent, had died. This difference is thought to be significant.

**The effect of mineral oil administration upon the nutritional economy of fat-soluble vitamins.—I, Studies with the vitamin A of butter fat, R. W. Jackson** (*Jour. Nutrition, 4* (*1931*), *No. 2, pp. 171–184, figs. 5*).—The conclusion of Dutcher et al. (E. S. R., 58, p. 88) that mineral oil administered to rats with vitamin A in the form of a barely adequate dosage of butterfat decreases considerably the availability of the vitamin was confirmed, but data are reported showing that if the mineral oil is fed separately and at a different time from the butterfat it causes only a very slight, if any, loss in the vitamin. A moderate increase in the amount of butterfat sufficed to protect the animals completely. It is concluded that "although a vitamin A deficiency such as may be brought about by mixing mineral oil with the butterfat should be avoided, it does not necessarily follow that under the conditions of the customary human therapeutic practice mineral oil is responsible for any such deficiency."

**Vitamin A and carotene.—VII, The distribution of vitamin A and carotene in the body of the rat, T. Moore** (*Biochem. Jour., 25* (*1931*), *No. 1, pp. 275–286, figs. 2*).—In continuation of the investigation noted previously (E. S. R., 64, p. 393), a detailed study is reported of the distribution of vitamin A and carotene throughout the body and intestinal contents of rats receiving large amounts of carotene as the sole source of vitamin A. Rats which had received lavish amounts of red palm oil or carrot fat for prolonged periods were killed and their tissues dissected and tested for vitamin A and carotene by colorimetric methods.

Unchanged carotene was found throughout the entire alimentary tract and in small amounts in the liver oils of the animals which had received the carotene-rich material up to the time of killing. Pigmented fat from the feces was found to be biologically active at a level based upon its apparent carotene content.

The liver oils contained vitamin A in very high concentration, but with the exception of very small amounts in the storage fats of the body and occasionally in the lung and kidney oils, all of the other tissues examined gave negative results for vitamin A.

In rats kept for 68 days on the basal diet alone after prolonged carotene feeding, unchanged pigment had practically disappeared from the liver, but the concentration of vitamin A in the storage fats remained about the same, approximately $\frac{1}{100\,000}$ that of the liver oil.

"From the above evidence it is deduced that the conversion of carotene to vitamin A probably takes place in the liver, that the efficiency of the conversion is by no means quantitative and that the liver plays an important rôle in the regulation of the concentration of the vitamin throughout the remainder of the body."

**Vitamin A deficiency in the albino mouse, J. M. Wolfe and H. P. Salter, Jr.** (*Jour. Nutrition, 4* (*1931*), *No. 2, pp. 185–192, figs. 6*).—Studies similar to those reported by Wolbach and Howe for rats (E. S. R., 54, p. 891) and guinea pigs (E. S. R., 60, p. 393) are reported on the pathology of vitamin A deficiency in mice.

In general the histopathology found was similar to that described by Wolbach and Howe for rats and guinea pigs. In both male and female animals placed on the vitamin A deficient diet at about 25 days of age, the normal epithelium in various organs was replaced by keratinized cells which usually began to grow in small clumps beneath the normal cells. The first changes generally appeared in the respiratory tract, but were closely followed by the symptoms of xerophthalmia. The severity of the eye symptoms, however, was slight as compared with the changes undergone by other structures of the body. In the nares, trachea, and bronchi there was extensive keratinization of the epithelium, and in the lungs bronchiectases were frequently found. No changes were evident in the stomach or intestines, but extensive changes in the bladder and the pelvis of the kidney. The males suffered testicular degeneration similar to that described by Mason for rats fed diets deficient in both vitamins A and E (E. S. R., 64, p. 591). No marked evidence of infection was found even in the later stages of deficiency.

Photomicrographs are given of the histological changes in various organs.

**The pathology of vitamin A deficiency** (*Jour. Amer. Med. Assoc., 97 (1931), No. 11, p. 782*).—This editorial, which is based upon the studies of Wolbach and Howe (E. S. R., 54, p. 891), Tyson and Smith (E. S. R., 61, p. 492), and Wolfe and Salter (noted above) on tissue changes which take place in various experimental animals as the result of vitamin A deficiency, raises the question as to whether or not there is real justification in designating vitamin A as the anti-infective vitamin. It is noted that the predominance of opinion seems to be that if infection appears it is secondary to the derangement of the epithelium, and that consequently the immunity which vitamin A is supposed to confer is due to its maintaining a healthy epithelial membrane, notably in the upper respiratory tract and its appendages.

**Effects of deficiency in vitamins in infancy: Caries of the teeth and vitamins**, C. E. Bloch (*Amer. Jour. Diseases Children, 42 (1931), No. 2, pp. 263–278, figs. 4*).—The investigation reported was carried out in the summer of 1930 on all the blind children and adolescents who were then pupils in the two State educational establishments for the blind in Denmark. In 64 of these pupils, 38 boys and 26 girls from 8 to 20 years of age, the blindness was due to xerophthalmia in infancy (E. S. R., 51, p. 267).

In most of the children of this group who were 12 years or more of age, the weight was found to correspond with the age and only 17 were below normal height. Nineteen of the children showed definite signs of having had rickets, and in nearly all of these the teeth showed more or less extensive changes. In 6 of the remaining children the teeth were normal in every respect. In the others there was more or less evidence of caries, but this could not be correlated with the time in which xerophthalmia had occurred and consequently could not be attributed to lack of vitamin A.

It is concluded that "in man, deficiency in vitamin A has no specific injurious effect on the formation and calcification of the teeth. A disposition to dental caries, therefore, can not be due to deficiency in vitamin A in infancy. Probably the same applies to a deficiency in vitamin B and C. In this respect one can not apply the conclusions from experiments on guinea pigs to man. Guinea pigs are hypersensitive to deficiency in vitamin C, and their incisors grow continuously. In man dental anomalies are due chiefly to abnormalities of the mineral metabolism during the period when the teeth are calcifying."

**Beneficial effects of fat in high sucrose diets when the requirements for antineuritic vitamin B and the fat-soluble vitamin are fully satisfied**, H. M. Evans and S. Lepkovsky (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 615–622, figs. 4*).—To determine whether fat is necessary in the diet only to exert a sparing action on vitamin B ($B_1$) as demonstrated previously (E. S. R., 62, p. 293), or is necessary per se, feeding experiments were conducted on rats on diets free from fat of any kind with the exception of 2 drops of cod-liver oil per rat per day, but containing vitamin B from different fat-free sources in amounts many times in excess of requirements, and on these same diets with the addition of vitamin-free fats. The fats included lard, coconut oil, and synthetic coconut and cottonseed oils (the purified esters), and the sources of vitamin B brewers' yeast, ether-extracted wheat germ and rice germ, and alcoholic extracts of rice bran and rice polish.

Composite growth curves of the several animals in each test showed that, regardless of the source or amount of vitamin B administered, growth on the fat-free diets was as great as on the same diets supplemented with fat. The animals on the fat-free diet showed no marked deficiency, but were decidedly inferior to those receiving fat in their diet as shown by coarser fur, a tendency toward skin dryness, and lower body weights. Since the synthetic fats improved the diets as well as did the natural fats and the diets were well supplied with vitamins, the conclusion is drawn that "'fat-free' diets which are no longer improved by the addition of vitamin B can nevertheless be slightly improved by the addition of fat."

**The relative antineuritic (vitamin "B") potency of certain milk derivatives, G. C. Supplee, O. J. Kahlenberg, G. E. Flanigan, and O. D. Dow** (*Jour. Dairy Sci., 14 (1931), No. 5, pp. 447–455, figs. 2*).—The water-soluble vitamin concentrate prepared from milk by removal of the fat, casein, albumin, and some of the milk sugar (E. S. R., 60, p. 94) was assayed for the antineuritic vitamin B concentrate by the curative pigeon method of Kinnersley et al. (E. S. R., 59, p. 294). For purposes of comparison, similar determinations were made of the vitamin B content of rice polishings, chemically pure lactose, and desiccated whey solids.

Using as the standard of minimum protective dose improvement within 5 hours and definite cure, lactose was found to be ineffective and rice polishings effective in doses of 0.5 gm. The milk vitamin concentrate was protective at a dosage of 1.5 gm. and the dry whey not completely effective at this dosage, but completely so in 3-gm. amounts. On the basis of the minimum protective dose for 3 days, it was estimated that 1 gm. of rice polishings contains about 4 times the antineuritic potency of 1 gm. of the dry material of the vitamin concentrate and 8 or slightly more times that of the dry whey.

It is noted that a subsequent report is to show that the limiting factor in the earlier studies on the vitamin B complex in the concentrate was vitamin B and not vitamin G.

**A study of the nitrogen balance in vitamin $B_2$ deficiency in the rat, S. K. Kon** (*Biochem. Jour., 25 (1931), No. 2, pp. 482–493, fig. 1*).—Following the individual control method as described in an earlier paper (E. S. R., 62, p. 587), the author has made a quantitative study of the nitrogen metabolism of rats subsisting on diets low in the heat-stable factor (or factors), vitamin $B_2$, of yeast. In all three pairs of rats, the controls receiving vitamin $B_2$ made better weight gains on a slightly lower food intake than the corresponding animals receiving no vitamin $B_2$. Two of the experimental animals stored less and one more nitrogen than the controls. In 15 pairs of nitrogen estimations, the experimental rats were favored in 6 and the controls in 9. When the biological value of the ingested nitrogen was calculated by the method of Mitchell, a slightly better efficiency was found in the case of the controls.

These findings are discussed from the standpoint of the possible rôle of vitamin $B_2$ in metabolic functions, with the conclusion that "while vitamin $B_2$ is undoubtedly in some way linked with the metabolic processes of the body, it is not at all evident whether this connection is to any extent of a different type from that of the general dependence of normal metabolic exchange upon the availability of any one of the indispensable food ingredients."

**Vitamin $B_2$ and pellagra: The etiology of pellagra, B. C. Guha** (*Brit. Med. Jour., No. 3679 (1931), pp. 53, 54*).—The author reviews briefly recent evidence which casts considerable doubt on the assumption that clinical and experimental pellagra is the result of a simple deficiency of vitamin $B_2$. The suggestion of Bliss (E. S. R., 64, p. 595) that pellagra is caused by a simple iron deficiency in the diet is thought to be untenable, although it is considered that iron may be one of the limiting factors, especially in so far as depilation is concerned. In view of the uncertainty of the identity of the two factors involved in the customary definition of vitamin $B_2$ (growth-promoting and antipellagric), it is thought that these terms should not be used interchangeably as has been the practice hitherto.

**The effect of pasteurization upon the vitamin C content of milk in the presence of certain metals, E. W. Schwartze, F. J. Murphy, and G. J. Cox** (*Jour. Nutrition, 4 (1931), No. 2, pp. 211–225, fig. 1*).—The authors, with the assistance of W. Waugh, E. Clark, and M. Marsh, have determined the extent of destruction of vitamin C in milk subjected to pasteurization in continuous flow pasteurizers of copper, tinned copper, and aluminum, with the conclusion that pasteurization in aluminum brings about a 20 to 40 per cent destruction, in tinned copper a slightly greater destruction, and in copper an 80 to 90 per cent destruction of vitamin C.

**A ration for the production of rickets in chicks, E. B. Hart, O. L. Kline, and J. A. Keenan** (*Science, 73 (1931), No. 1904, pp. 710, 711*).—This contribution from the Wisconsin Experiment Station calls attention to the suitability of the chick as an experimental animal for studies of bone development and the evaluation of sources of vitamin D, and describes a satisfactory dry ration and technic which have been developed for such studies. The ration consists of ground yellow corn 59, standard wheat middlings 25, crude casein 12, common salt 1, precipitated calcium carbonate 1, precipitated calcium phosphate 1, and dried yeast 1 per cent. On this ration day-old White Leghorn chicks are said to become distinctly rachitic in from 28 to 35 days, some of the birds dying at the end of this time with an ash content of the extracted tibias approximating 30 per cent. If supplied with sufficient vitamin D the chicks will weigh about 225 gm. at the end of 35 days, and the ash content of the extracted tibias will generally be about 43 per cent. As to technic, the curative type of experiment and the line test as used with rats are not possible with chickens, and reliance is placed solely on the percentage of ash in the extracted bone.

**Some effects of ultraviolet rays on the vitamin D content of plants as compared with the direct irradiation of the animal, M. Lojkin** (*Contrib. Boyce Thompson Inst., 3 (1931), No. 2, pp. 245–265, figs. 2*).—This study was undertaken primarily to determine whether growing green plants exposed either continuously or for a short period of time to the extreme ultra-violet region of sunlight or of an artificial source differ in their antirachitic properties from similar plants exposed to sunlight through ordinary greenhouse glass. Determinations were made of the minimum daily exposure necessary to protect rats when irradiated directly as compared with the minimum exposure of green plant tissue which, when subsequently fed, would protect rats to a similar extent. Comparisons were also made of the antirachitic potency of plants irradiated while living and still attached to the roots as compared with plants cut off and irradiated after a definite time period.

The rats, from stock on the Sherman diet B supplemented with meat and lettuce up to the time of the experimental period, were placed on the Sherman-Pappenheimer rachitic diet 84 at the age of 4 or 5 weeks and a weight of from 40 to 70 gm. The diet was supplemented with green lettuce previously shown to have no antirachitic properties.

The plants used for the experiment included lettuce, alfalfa, spinach, New Zealand spinach, cabbage, Swiss chard, and soybeans, the daily dosage consisting of 4 gm. of the fresh tissue. The plants were grown under ordinary greenhouse glass cutting out all rays shorter than those of wave length 312$\mu\mu$, under a special glass filter transmitting when new about 80 per cent of the rays of wave length 290$\mu\mu$, and in the open sunlight. None of the plants grown under greenhouse glass showed any antirachitic value. Cabbage and Swiss chard grown in the open or under glass likewise showed no antirachitic property. A slight improvement was noted in the calcification of the bones of the rats receiving soybeans, New Zealand spinach, lettuce, and alfalfa grown outside and under the special glass as compared with those receiving the same plants grown in the greenhouse. All of the rats, however, developed rickets even when fed the green plants ad libitum.

Irradiation of the plants with a mercury vapor lamp formed an appreciable amount of vitamin D in all of the plants except cabbage. Cut plants showed a much higher response to the irradiation than intact plants. Tests of the irradiated living plants at varying lengths of time after irradiation showed no loss in the acquired antirachitic property in 24 hours, but some loss beyond that time.

Complete calcification of the bones took place in young rats on the rachitic diet exposed to sunlight transmitted through the special filter for a period of 30 minutes in winter or 15 minutes in summer or spring, while an exposure of 1 minute a day to the rays of the mercury vapor lamp transmitted through various filters was effective except in the case of the filter transmitting wave lengths shorter than 285$\mu\mu$. In contrast with this an exposure of 30 minutes daily to the ultra-violet lamp was necessary to render the plant tissue effective. "Since it is believed that in case of direct irradiation of the animal the curvative effect of ultra-violet rays is due to the activation of the ergosterol contained in the skin, these results indicate that the content of ergosterol which can be activated by ultra-violet radiation is considerably smaller in plant tissue than in the epidermal layers of animal tissue."

**Studies on the effects of overdosage of vitamin D, II,** R. F. LIGHT, G. E. MILLER, and C. N. FREY (*Jour. Biol. Chem.*, *92* (*1931*), *No. 1*, *pp. 47–52*).—The authors have extended their investigation of the effects of moderate and extreme deficiency of vitamin D on the ash content of the bones of rats (E. S. R., 62, p. 792) to the third and fourth generations, with the following findings:

"Moderate overdosages (40 units) of vitamin D daily have no effect on the mineral metabolism of white rats when continued through the third and fourth generations. No pathological calcification occurs and the ash of the bones is normal. Animals receiving a moderate overdosage of vitamin D for a long period of time are more susceptible to a massive overdosage than normal animals. A large overdosage (2,500 units) of vitamin D just insufficient to produce toxic symptoms in the first and second generations, given for a long period of time, does produce striking pathological changes in the third and fourth generations. These changes are (a) decalcification of the bones, (b) severe calcification of the kidneys, and (c) certain pellagra-like symptoms, namely, scabby conditions of the feet, nose, and forequarters."

**A tentative method of assaying foods for vitamin G,** H. E. MUNSELL (*Jour. Nutrition*, *4* (*1931*), *No. 2*, *pp. 203–210*, *figs. 5*).—In the method developed, the Sherman-Spohn vitamin B-free diet (E. S. R., 51, p. 368) was modified by the substitution of white corn for cornstarch to the extent of 30 per cent of the diet. On this diet, with plenty of autoclaved yeast as the source of vitamin G, young rats are said to grow normally. With graded amounts of autoclaved yeast or other vitamin G-containing materials, growth is proportional to the amount fed. It is emphasized that in using white corn as the sole source of vitamin B account should be taken of the small amount of vitamin G which it contains. This can be done by comparing all results with those obtained with the control animals on the basal diet alone.

**Studies in nutritional anemia.—Quantitative variations in iron, copper, and manganese supplements,** H. S. MITCHELL and L. MILLER (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 421–434, fig. 1*).—In this contribution to the problem of the optimum mineral supplement for hemoglobin regeneration in rats suffering from milk anemia, an extensive series of experiments is reported with the following results:

The administration of a pure iron salt was followed by a slow but definite hemoglobin response, which, within the limits tested, was directly proportional to the amount of iron fed. Since the iron salt fed "was of such purity as to preclude possibility of significant copper contamination," the slow regeneration of hemoglobin was attributed to traces of copper available from the milk supply or stored in the body.

Rapid synthesis of hemoglobin followed when copper, even in amounts as low as 0.01 mg. daily, was fed in addition to 0.5 mg. of iron. Tests with varying amounts of copper led to the conclusion that the optimum amount for the rat is between 0.1 and 1 mg. daily. The optimum amount of iron was likewise estimated to be about 0.25 mg. daily if sufficient copper is provided. It is thought that the 0.5 mg. of iron daily used by many investigators is more than required, and may not be desirable when testing the supplementary action of graded doses of other factors.

The addition of manganese in amounts varying from 0.01 to 0.1 mg. daily was without appreciable effect in hemoglobin synthesis, but was thought to have a slight stimulating effect on growth and food intake.

Attention is called to the importance in nutritional anemia studies of having a uniformly low hemoglobin at the time when mineral additions are to be made.

**The fuel of muscular activity of man,** T. M. CARPENTER (*Jour. Nutrition, 4 (1931), No. 2, pp. 281–304*).—This is a critical review of the literature on the subject of the source and kind of material which furnishes the energy for the performance of muscular work. In the opinion of the author, "it would seem as though with extremely light work the available metabolites which result from the mixture of nutrients at rest were first used. These may be conceived of as small molecules from carbohydrate, protein, and fat. When the metabolites from fat, which are easily oxidized, are disposed of, the carbohydrate would be drawn upon because this may be the more easily metabolized. Subsequently the available type of carbohydrate becomes diminished, and then there is a diminishing amount of carbohydrate metabolized with an increasing amount of fat."

**Newer knowledge on botulism and mussel poisoning,** K. F. MEYER (*Amer. Jour Pub. Health, 21 (1931), No. 7, pp. 762–770*).—In this paper the author summarizes by number of outbreaks and foods involved the outbreaks of botulism which have occurred yearly from 1899 to 1930, inclusive. Of a total of 191 outbreaks, 129 were traced to home preserved foods and 43 to commercially prepared foods, while 19 were of unknown origin. String beans headed the list of foods, with a total of 50 outbreaks, followed by corn with 22, olives 14, spinach 12, pork products 10, asparagus 9, sea foods 7, and beets 5 outbreaks, with a number of other vegetables, fruits, and meat products contributing from 1 to 4 outbreaks each. Attention is called to the fact that commercially preserved foods have not been connected with any of the recognized cases of botulism since 1925.

Mussel poisoning, of which there was a serious outbreak in the vicinity of San Francisco in July, 1927, has received considerable attention. Periodic examination of mussels in a section of the California coast has shown that while small amounts of toxin may be demonstrated at other times, the mussels in that vicinity become definitely toxic during July and August. On this account their sale has been forbidden during the past two summers.

**The prevention of goiter in Detroit and Cleveland,** O. P. KIMBALL (*Jour. Amer. Med. Assoc., 97 (1931), No. 25, pp. 1877–1879*).—A striking demonstration of the effectiveness of the state-wide use of iodized salt for the prevention of goiter in endemic regions is afforded by this comparison of goiter surveys made in Detroit, Mich., and Cleveland, Ohio. In Michigan iodized salt has been in general use since May, 1924, while in Ohio it has not come into general use on account of active opposition against it. Yearly goiter surveys of school children in Detroit have shown a decrease in incidence of goiter from 36 per cent in 1924 to 2.1 per cent in 1931. Although there have been no systematic goiter surveys in Cleveland, a comparison was possible for the two cities for 1924 and 1931, including a total of 5,075 examinations in Detroit and 3,175 in Cleveland. In 1924 the total incidence of goiter in the regular schools of the two cities was about the same, 36 per cent for Detroit and 34 per cent for Cleveland. In 1930-31, the incidence of goiter in special schools in Detroit was 12 per cent and in Cleveland 30 per cent. When the 1930-31 cases were further classified as to the presence of hypoplasia, or a uniform colloid enlargement indicative of iodine deficiency, the percentage dropped to 0.3 per cent in Detroit and 18 per cent in Cleveland.

The author is of the opinion that "the rapid disappearance of endemic goiter among school children throughout Michigan is one of the outstanding achievements in preventive medicine."

**The cause of obesity,** L. H. NEWBURGH (*Jour. Amer. Med. Assoc., 97 (1931), No. 23, pp. 1659–1663, figs. 4*).—This is a general discussion of studies noted previously from other sources (E. S. R., 65, p. 793), demonstrating "that there is only one basic cause of obesity—that it is invariably the result of overeating; expressed technically, that the available energy of the diet exceeds the transformation of energy on the part of the individual."

## HOME MANAGEMENT AND EQUIPMENT

**[Studies of household equipment by the Virginia Station]** (*Virginia Sta. Rpt. 1928–1931, pp. 60–62*).—In tests of washing machines, much better results were obtained when the temperature of the wash water was from 140 to 160 and 170° F. At these temperatures the cleaning continues longer and is quicker. It appears that about 50 per cent of the cleaning is done in the first 5 minutes of time, and that what is done after that comes more slowly in the last 15 minutes.

In hot water heating studies, an ordinary 30-gal. range boiler tank and 2,000-watt "side arm" heater with thermostat was used, both bare and with a wool felt jacket and with 1-in. asbestos plaster. "Results show conclusively that this outfit will heat water in amounts and with top temperatures sufficient for household requirements. Over-all efficiency is not high, and it is easily seen that the complete units now on the market are far ahead of this installation in efficiency. The cost of electricity for heating water is higher than for any other energy, but with rates for current constantly being reduced and with any kind of value being given to the automatic, care free features, electricity can compete with other forms of energy. . . . In the ordinary operation of the outfit fully 50 per cent of the energy can be saved by proper insulation."

Tests with about 15 electric irons showed uniformity in sizes, weights, and current consumption, but considerable variance in the heating ability and maintenance of temperature.

## MISCELLANEOUS

**List of bulletins of the agricultural experiment stations for the calendar years 1929 and 1930,** C. E. PENNINGTON (*U. S. Dept. Agr., Misc. Pub. 128* (*1932*), *pp. 88*).—This list, arranged by States and containing author and subject indexes, supplements that previously noted (E. S. R., 62, p. 795).

**Forty-third Annual Report [of Arkansas Station], 1931,** D. T. GRAY ET AL. (*Arkansas Sta. Bul. 268* (*1931*), *pp. 74*).—This contains the organization list, brief summaries of the chief lines of work of the station, and a financial statement for the fiscal year ended June 30, 1931. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

**Annual report of the director for the fiscal year ending June 30, 1931,** C. A. MCCUE ET AL. (*Delaware Sta. Bul. 172* (*1931*), *pp. 51*).—This contains the organization list, a report of the director including a financial statement for the fiscal year ended June 30, 1931, and departmental reports. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

**Fiftieth Annual Report of the New York State Agricultural Experiment Station, [1931],** U. P. HEDRICK (*New York State Sta. Rpt. 1931, pp. 122, fig. 1*).—This contains the organization list, a review of the work of the station, a financial statement for the fiscal year ended June 30, 1931, and meteorological data noted on page 509. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

**Report of the Porto Rico Agricultural Experiment Station, 1930,** T. B. MCCLELLAND ET AL. (*Porto Rico Sta. Rpt. 1930, pp.* [2]+*50, figs. 20*).—This contains the organization list, a report of the director including practical results of the work of the station, a retrospect and a discussion of forage crops for Porto Rico by D. W. May, and reports of the assistant chemist, horticulturist, plant breeder, agriculturist, and parasitologist. The experimental work is for the most part abstracted elsewhere in this issue.

**Annual Report of the Virginia Agricultural Experiment Station, [1928–1931],** A. W. DRINKARD, JR. (*Virginia Sta. Rpt. 1928–1931, pp. 87, figs. 6*).—This contains the organization list, a report of the director on the work of the station, departmental reports, meteorological data, and financial statements for the fiscal years ended June 30, 1928 to 1931. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

**Report of the West Virginia Agricultural Experiment Station for the biennium ending June 30, 1930,** F. D. FROMME (*West Virginia Sta. Bul. 244* (*1931*), *pp. 60, figs. 8*).—The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

# NOTES

**Georgia College.**—Data recently published in *Georgia Agriculturist* indicate that since 1925 the percentage of women graduating from the college has risen from 25.7 to 50. Of the graduates in 1931, 15 men and 30 women are engaged in teaching, 1 man as county agent and 10 women as home demonstration agents, 2 men and 5 women in research, 6 men and 6 women as graduate students, 7 men as farmers and 5 women as home makers, 7 men as foresters, 6 men as veterinarians, 3 men in landscape work, 3 men in business relating to agriculture and 2 in business not so related, 1 woman in institutional management, and 8 men and 7 women in all other occupations. Only 2 men and 6 women had not been placed during 1931.

**Indiana Station.**—*Purdue Agriculturist* notes the resignation of Dr. Frank P. Cullinan, research associate in pomology, to assume charge of peach production investigations for the U. S. Department of Agriculture.

**Massachusetts College.**—The summer school established in 1907 is to be omitted in 1932 as an economy measure to meet the emergency caused by an increase of 20 per cent in the undergraduate student enrollment in regular courses and a prospective decrease in State appropriations.

**West Virginia University and Station.**—The new university library, built at a cost of more than $410,000 and housing 300,000 volumes, was recently dedicated by State and university officials. More than 15,000 books and periodicals relating to agriculture are available.

It is reported that of the current freshman class in agriculture three-fourths are farm reared, and that nearly one-half of the class have had training in vocational agriculture. A course in agricultural orientation is required of all freshmen.

At the twenty-fourth annual farm and home week held in February, 488 men and 288 women were registered. These figures represent a slight increase over attendance a year ago.

For the first time in the history of the station practically all departments are engaged in a single study—that of land utilization of the Huntington area, comprising five counties, in which detailed records will be kept on 150 to 200 farms chosen as representative of 10 or more types of farming. Factors involved include the physical factor, such as the land and its productivity; the organization of the farm as to volume of business, yields of crops, rotations followed, kinds of livestock, and production costs; market prices and marketing costs; effect of insects and plant and animal diseases; and the human or managerial factor.

Other recent research includes studies of (1) the availability of phosphorus compounds, conducted by the department of agronomy and genetics, with field work conducted in the soil bins of the agronomy farm at Morgantown; (2) the training and pruning of apple and sour cherry trees on the university experiment farm at Kearneysville and on private orchards in the eastern panhandle, conducted by the department of horticulture; and (3) deep tillage with field, truck, and orchard crops on the university experiment farm and elsewhere in the eastern panhandle, aiming to study the effect of the Killefer method of tillage on yields of alfalfa, potatoes, and corn and in promoting growth in apple and peach orchards. This project is being conducted jointly by the departments of farm economics, agronomy, and horticulture.

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# EXPERIMENT STATION RECORD

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## EDITORIAL

### THE DISTRIBUTION OF EXPERIMENT STATION PUBLICATIONS IN FOREIGN COUNTRIES

Among the questions considered by the subsection of experiment station work at the 1931 convention of the Association of Land-Grant Colleges and Universities was one of policy as to the foreign distribution of experiment station publications. This question was presented by Dr. Andrew Boss, vice director of the Minnesota Experiment Station, and the outcome of the ensuing discussion was the appointment of a special committee to study the matter. In addition to Dr. Boss, the committee consists of Directors B. E. Gilbert of Rhode Island and S. B. Doten of Nevada, with Mr. J. T. Jardine, chief of the Office of Experiment Stations, as chairman. This committee has been actively engaged in assembling information on various phases of the subject.

The problem of foreign distribution is one of considerable complexity and increasing importance. Although a good deal of the research of the experiment stations is now published in scientific journals, most of it still finds formal presentation through the bulletins and other series of the institutions themselves. Some of these publications are mainly of local appeal, but others are distinct contributions to knowledge and of interest to workers in agricultural science throughout the world. Yet, as Dr. Boss reported, a questionnaire circulated by his station revealed that while distribution to the libraries in the United States is adequate, "only a few States have built up a mailing list of foreign institutions of any appreciable size."

Among the stations constructively endeavoring to meet the increasingly heavy demand from abroad for their publications, the Minnesota Station has rendered a notable service by its compilation of a classified list of libraries of foreign institutions which it has been using for some time. This list was prepared by three members of its staff, Drs. J. G. Leach, H. Macy, and C. H. Bailey, and includes approximately 1,100 libraries. About 600 of these are arranged in a general class to receive all bulletins of the station, while special lists are also provided for the fields of agronomy and plant genetics, plant pathology and botany, agricultural biochemistry, dairy husbandry and bacteriology, engineering, forestry, horticulture, entomology and economic zoology, animal husbandry, agricultural economics, poultry, soils, veterinary science, and home economics.

An examination of this list as a whole indicates that it embraces most of the outstanding institutions of the respective countries for which data have been compiled. Prepared as it has been specifically for experiment station use, it should be of assistance to the stations generally. The inherent difficulty in all lists, however, including those attempted by this Office from time to time, is that they can seldom afford sufficient information to evaluate with completeness and precision the relative importance of their constituent items. This is not vital if the lists are to be used in their entirety, but where they are so comprehensive as to involve larger editions of station publications than can readily be supplied they raise the question of a possible basis of elimination. For such purposes what is really needed is enlightenment as to the size, equipment, and especially the lines of work and objectives of the various institutions abroad.

Details of this sort have been noted and filed by this Office for many years as an incidental phase of its basic activities, and in 1902 a bulletin of nearly 300 pages was issued under the title of Agricultural Experiment Stations in Foreign Countries. A revision of this bulletin treating of nearly 800 institutions was completed in 1904, but since that time it has not proved feasible to publish additional information except in occasional articles on the progress of agricultural research abroad in the annual reports of the Office and in *Record* editorials or as brief items in the *Record* notes. Unfortunately, the preparation of a thoroughgoing revision of the bulletin itself after the lapse of more than a quarter century of unparalleled development of agricultural research institutions in nearly every country of the globe has now become a project far too elaborate for consideration under existing conditions, despite its admitted value for many purposes.

An attempt to meet in part the need for information of this sort has recently been made by the International Institute of Agriculture at Rome through its publication of a handbook entitled Stations Expérimentales et autres Institutions Officielles ou Privées s'occupant du Développement et de l'Amélioration de l'Agriculture dans les Pays Chauds (E. S. R., 66, p. 88). This handbook lists over 800 institutions in 76 countries, and gives for many of them brief notes as to their organization, area, and field of operation. As the title implies, however, it is regional in scope and thereby restricted in direct interest for this country mainly to the southern tier of stations. It is also uneven in treatment as regards the various countries, apparently in many cases because of difficulties encountered in securing the necessary information. Nevertheless for the Tropics in general it has assembled a large amount of data nowhere else available, and a revision, which is now said to be under way, will doubtless in due time provide opportunity for a more complete presentation.

Another avenue of approach toward the objective of wide dissemination of the essential results of agricultural research is indirectly through the use of abstract journals. Within recent months *Biological Abstracts*, for example, has made notable progress in extending the comprehensiveness of its foreign review and in the promptness of publication of material. Mention should also be made of *Social Science Abstracts*, which through the extensive use of author abstracts and other means is making available abstracts of many articles nearly as soon as the originals can be distributed.

In the case of *Experiment Station Record*, it is not always realized that this journal is unique in that it abstracts systematically, completely, and approximately in chronological order all publications of the State experiment stations and the U. S. Department of Agriculture. Special efforts are also made to include all contributions of these institutions to scientific journals and through other channels, and as recently announced it is hoped that the impending change in policy under which abstracts of the annual reports will be greatly shortened will permit of prompter publication of material and a more extensive foreign review.

The present distribution of the *Record* abroad includes approximately 1,200 institutions. Not improbably there are not a few others of considerable prominence which do not receive it, but nevertheless the claim may be fairly made that it is available through some reasonably accessible center to most research workers in agriculture throughout the world.

Obviously, for many purposes abstracts can not take the place of the original publications, and the practical difficulty often confronts the stations and the Department of supplying the demand resulting from the abstracts. Automatic distribution to mailing lists avoids some of this embarrassment but, it may be suspected, at the cost of some copies which may not be really needed and a considerable expense for postage. As an alternative when such considerations are important, much may usually be accomplished far more economically by confining the foreign distribution mainly to individual requests.

This is especially true if the danger of the exhaustion of editions before such requests can be received is obviated by setting aside a special reserve stock by the stations for use in this way. Such a distribution not only aids the issuing agency but reduces to a minimum the burden on the smaller institutions abroad of maintaining permanent files of the approximately 1,300 publications which are usually issued each year by the experiment stations of the 48 States and the Federal Department, and it may prove reasonably serviceable if complete collections can be made available at a relatively few strategically located centers.

Much the same procedure may also prove workable for the institutions in this country. In exchange for the *Record* and other material or on a subscription basis, most foreign publications relating to agriculture and home economics are regularly received by the Department Library and under ordinary conditions are available for loans. This is a service which might well be supplemented to a greater or less extent by other libraries elsewhere in this country which are in a position to enter this specialized and difficult field.

A loan plan necessitates some adjustments if extensively operated to render the publications easily accessible to workers in institutions not attempting this service. It also imposes a definite responsibility on abstract journals to safeguard their readers by covering the foreign field with certainty and celerity. Still other difficulties may doubtless be anticipated, but perhaps not in insurmountable form. Among the distinctive advantages of this plan, as compared with an elaborate system of exchanges by individual institutions here and abroad, would be its relative simplicity and economy.

Probably no single method of distribution of publications will meet the situation completely, and the solution may prove to be some combination adaptable to the requirements of the individual institutions sending and receiving. Some stations may be able to utilize extensive mailing lists, with their inherent advantages of convenience and wide circulation. Others may find it necessary to restrict their output abroad to a relatively few well-located centers and a limited request distribution based on publicity secured mainly through abstract journals and in similar ways. In any event, however, what seems to be most needed for an equitable decision is more complete information as to the attitudes and availabilities of the various foreign institutions. The suggestion is therefore made that such institutions as would like to develop exchange relationships and are in a position to serve as regional centers could greatly assist in bringing about such an outcome by indicating to this Office their interest in the matter. Additional information and views pertinent to the problem would also be very helpful.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**Recent advances in biochemistry,** J. PRYDE (*London: J. & A. Churchill, 1931, 3. ed., pp. X+393, figs. 42*).—The subject matter of the original book (E. S. R., 56, p. 309) has been revised extensively in the preparation of the present edition. Particularly, "two new chapters have been added, one on protein structure and proteolytic enzymes, the other on the cholane series, which includes the bile acids and sterols. Other chapters have been recast and considerable new material has been added to them. On the other hand, two chapters of the previous edition have been omitted. These are colloids and the physical chemistry of proteins and chemotherapy," the last named topic being noted as having been made the subject of an entire monograph of the same series.

**The chemical microscopy of plants,** O TUNMANN, rev. by L. ROSENTHALER (*Pflanzenmikrochemie. Berlin: Borntraeger Bros., 1931, 2. ed., rev. and enl., pp. XXIII+1047, figs. [196]*).—This second edition consists of the original text of Tunmann (E S. R, 32, p. 308), enlarged and brought up to date by Rosenthaler. Following a short introduction, the subject is divided into a general part, including the collection and preservation of the material, some notes on the making of preparations, remarks on reagents and reactions, microsublimation, clearing, swelling, and bleaching reagents, maceration methods, microtome technic, general statements [rather limited in scope] concerning staining, optical considerations, determination of refractive index, dark field illumination and ultramicroscopy, counts and measurements, the micromanipulator, permanent preparations and their production, subvisible structures, ash preparations, and carbonized preparations; and a special part in which are taken up, with many subdivisions, the four main topics of inorganic substances, organic substances (with the primary subheads acyclic substances and isocyclic and heterocyclic substances), the protoplast, and the cell membrane. An appendix of brief notes on various phases of the technic and a general index conclude the volume.

**Investigations into the molecular morphology and molecular kinetics of proteins.—I, The significance of ions with reference to the inner stability of the protein molecule (casein)** [trans. title], G. ETTISCH and G. SCHULZ (*Biochem. Ztschr., 239 (1931), No. 1-3, pp. 48-73, figs. 7*).—Among the observations recorded are the following:

An alteration in the ionic condition of a protein solution must affect the inner structure of the protein molecule. The combination of casein with alkalies is an expression of two distinct actions, the one a more or less instantaneous ionic reaction, the other a secondary reaction continuing for several hours and involving a slow alteration of the protein molecule. Alkalies effected an irreversible splitting off of diffusible units from the casein molecule, this process occupying several hours and forming a part, therefore, of that designated the secondary reaction. Neutral salts effected no breakdown of the molecule.

The lowering of viscosity through the action of alkalies and by that of neutral salts was found to be of two types For the drop in viscosity under the influence of alkalies, pH ranges of the reversible and of the irreversible reactions could be differentiated. The alkali-induced viscosity changes appeared also in two distinct time phases, the viscosity rising during the first few minutes and thereafter falling off for a number of hours. Neutral salts lowered the viscosity during the first few minutes. These viscosity effects in casein solutions are considered expressions of the space relations, dilation and contraction, of the casein molecule, alkalies causing a dilation in the first phase, whereas the first action of neutral salts is to bring about a contraction. On the basis of the Zwitter ion theory, it is noted, one may view these processes as the results of increases or decreases, respectively, in the activity of the protein ions. The contraction in the second phase of the secondary reaction is set down as a result of the molecular breakdown brought about by the alkali.

It was found that in the pH range 7.4 to 11 the alkali hydrolysis may be hindered by sodium chloride, the breakdown depending, it is stated, within the limits of H-ion concentration indicated upon the increase in ionic activity induced by the alkali. Beyond pH 11 neutral salts were no longer effective to prevent breakdown, the reaction here being a chemical effect of the hydroxyl ions and an irreversible hydrolysis, whereas the reaction ascribed to increased ionic activity was found reversible.

It was found possible to delimit the range within which the degree of dispersion of the protein appeared a reversible function of the ionic concentration.

**On the effect of imine group-forming substances upon sugar hydrolysis as effected by yeast, I [trans. title],** F. Zuckerkandl and L. Messiner-Klebermass (*Biochem. Ztschr., 239 (1931), No. 1-3, pp. 172-181*).—The authors found that yeast which had been poisoned with iodoacetic acid or with sodium fluoride so that it effected no detectable fermentation of glucose was again enabled to attack this sugar by the addition of certain imine-forming amines, such, for example, as the hydrochlorides of para-phenylenediamine and of aniline, tyrosine, etc.; ethyl alcohol and glycerin having been detected among the hydrolysis products. The imine groups of the compounds of which the formation led to the restoration of the enzymic activity are credited with the capacity to split off water from the glucose molecule and so to bring about its breakdown into two 3-carbon residues. A possible relation of the observed action of imines and imine-forming substances to the action of coenzymes found to contain adenine, furnishing the group $\underset{|}{N}=\underset{|}{C}-NH_2 \rightleftarrows H\underset{|}{N}-\underset{|}{C}=NH$, is suggested. In this connection it is noted that aminothiotriazol, containing the same grouping, was found very effective.

**Inhibition of the acetone-butyl alcohol fermentation by acids,** A. M. Wynne (*Jour. Bact., 22 (1931), No. 3, pp. 209-237, figs. 3*).—Of the 30 acids, inorganic and organic, studied by the author of this contribution from the University of Toronto, the following effected complete inhibition between pH 3.90 and pH 3.65: Hydrochloric, nitric, sulfuric, orthophosphoric, succinic, malonic, maleic, levulinic, crotonic, glycolic, $\beta$-hydroxybutyric, formic, acetic, propionic, butyric, and isobutyric. "The toxic effects of these acids are probably associated with a 'critical' H-ion concentration in the cell interior, closely approximating the observed extra-cellular H-ion concentration associated with the inhibitory effect.

"The three chloracetic acids are much more toxic than acetic acid. Their effect is not one of H-ion concentration, but is probably due to the specific influence of the chlorine atom. Hydroxy derivatives of the lower fatty acids are not more toxic than the normal acids at equivalent H-ion concentration levels. The evidence suggests that, in the case of the 3-carbon acids, the reverse may be true. Pyruvic, lactic, and glyceric acids were tolerated by the organism at H-ion concentration levels higher than for any other acids. In the lower fatty acid series, formic, acetic, propionic, butyric, and isobutyric acids inhibited the fermentation at nearly equivalent H-ion concentration levels, but with each successive higher homologue the inhibiting H-ion concentration was appreciably lower: e. g., pH values of 3.65–3.75 for the first five members, including isobutyric, and pH values of 3.90, 4.35, 4.75, 5.00, and 5.10, respectively, for valeric, caproic, heptylic, capyrlic, and nonylic acids. . . .

"Capillary activity has relatively little effect in the case of formic, acetic, propionic, and butyric acids, but with the higher homologues its influence is very marked. . . . Adsorption of the capillary active acids is probably the chief reason for the regularly increasing toxicity of these homologues."

**Carotenase: The transformation of carotene to vitamin A in vitro,** H. S. OLCOTT and D. C. MCCANN (*Jour. Biol. Chem., 94 (1931), No. 1, pp. 185–193, figs. 4; abs. in Science, 74 (1931), No. 1921, p. 414*).—Evidence indicating the transformation of carotene into vitamin A in vitro is reported, essentially as follows:

From the livers of two rats which had ceased to grow on a vitamin A-free ration, an extract was prepared by grinding the livers with sand and water, allowing the mixture to stand for 24 hours at 37°C., and then filtering. One portion of the filtrate was extracted with ether and its absorption spectrum determined. No absorption at 325 mμ was evident, indicating that the extract contained no vitamin A. Another portion of the filtrate was mixed with a few cubic centimeters of a colloidal solution of carotene in water and after incubation for 36 hours was extracted with ether. This extract, which was colorless, showed a definite absorption band at 325 mμ but none at 340 mμ, thus indicating the presence of vitamin A but not carotene. A final portion of the original filtrate was boiled for one minute and treated with carotene as before. After incubation this extract, which was yellow, showed an absorption band at 340 mμ but not at 325 mμ.

These tests are considered to demonstrate the presence in the original extract of an enzyme, carotenase. This, in the second portion of the extract, converted carotene into vitamin A, but was destroyed by the heating to which the third portion was subjected.

**The isolation of carotene from the adrenal glands** [trans. title], O. BAILLY and R. NETTER (*Compt. Rend. Acad. Sci. [Paris], 193 (1931), No. 20, pp. 961–963*).—The authors have isolated 0.3 gm. of carotene in crystalline form from 30 kg. of beef adrenal glands by two successive extractions with alcohol acidified with acetic acid, followed by acetone, and saponification with alcoholic potassium hydroxide. This was followed by agitation with petroleum ether, which dissolved a small quantity of the carotene but left the greater part in the alcohol phase, from which it crystallized on evaporation in vacuo. The crystals were finally washed with warm methyl alcohol. When dissolved in carbon disulfide in a concentration of 5 mg. per liter, the carotene on spectrographic analysis showed the two bands characteristic of vegetable carotene, from 510 to 525 mμ and from 480 to 490 mμ. It is considered that the carotene is present in both the cortex and medulla. In view of the importance attributed to the adrenal glands both in growth and as a defensive agent against infection, the finding of appreciable amounts of carotene is considered of significance.

**Estimation of vitamin A in butter,** B. G. E. MORGAN and K. H. COWARD (*Lancet [London], 1931, II, No. 14, pp. 758, 759*).—In the technic for determining the vitamin A content of cod-liver oils by the method of Coward et al. (E. S. R., 65, p. 588), care is always taken to dissolve the cod-liver oil in the same amount of inactive olive oil so that the absolute quantity of fat remains constant. In applying the method to butter and margarines, different amounts of fat are involved, and it is consequently of interest that equally consistent results were obtained. The samples tested were a fresh summer butter and a margarine advertised to have a vitamin A potency equal to butter. This claim appeared to be justified, for the butter and margarine, both of which were purchased on the open market, were of equal potency, one thirtieth that of the cod-liver oil adopted as standard.

**Heat of combustion of activated ergosterol,** C. E. Bills, F. G. McDonald, LaM. N. BeMiller, G. E. Steel, and M. Nussmeier (*Jour. Biol. Chem., 93* (*1931*), *No. 2, pp. 775–785, figs. 2*).—Ergosterol purified by repeated crystallization from alcohol-benzene 2:1 was exposed in saturated solution in boiling ether to a magnesia-cored carbon arc until 40 per cent of the sterol was altered. When the ether was evaporated and the residue separated from unchanged ergosterol by treatment with methyl alcohol at 0° C., a resinous substance was left which proved to be fairly stable in an inert atmosphere but to change when exposed to air. Parallel calorimetric, polarimetric, spectrographic, and biological measurements were made of the original ergosterol, the fresh resin, and the resin after standing at 24° under carbon dioxide for 24 hours and after standing 3 and 45 days, respectively, exposed to air.

The heat of combustion of the ergosterol was 9,950 calories per gram, a value lower than previously reported (E. S. R., 62, p. 693). The fresh resin and that kept under carbon dioxide for 24 hours had practically identical heats of combustion, but the oxidized products had increasingly lower heats of combustion. These observations are thought to confirm the hypothesis that vitamin D is a simpler isomer of ergosterol, and to indicate that it does not constitute the major part of the resin.

Determinations by the improved line test technic (E. S. R., 65, p. 595) of the vitamin D content of the various preparations showed no significant differences in the resins after various exposures, except in the sample heated after long exposure to air. Even in this about half of the original activity was still present. The absorption maxima, however, were quite different in the various preparations. In the fresh resin it was at 207 mμ, in the resin preserved under carbon dioxide 272 mu, and in the air-exposed resins at 261 and 253 mμ. These observations are thought to indicate that the vitamin itself does not absorb, but that absorbing substances are formed from ergosterol simultaneously with the vitamin.

The antirachitic potency of the resin was found to be somewhat higher than calculated values for the calciferol of Angus, Askew, et al. (E. S. R., 66, p. 9).

It is thought probable, as suggested by these authors, that vitamin D may exist in more than one form.

**The unsaponifiable lipids of lettuce, II, III,** H. S. Olcott and H. A. Mattill (*Jour. Biol. Chem., 93* (*1931*), *No. 1, pp. 59–70*).—In continuation of the series noted previously (E. S. R.. 66, p. 92), two papers are presented.

II. *Fractionation* (pp. 59–64).—Using a method similar to that employed by Evans and Burr in their attempted isolation of vitamin E (E. S. R., 58, p. 595), the authors have fractionated the unsaponifiable lipids of lettuce with the isolation of alcohols of high molecular weight, several sterols, carotene, and concentrates of vitamin E and of an antioxidant. The vitamin E was concentrated in the petroleum-ether soluble fraction and finally obtained as a clear, light yellow oil solidifying at about 0° C. after distillation in vacuo but without crystal formation. The antioxidant on the other hand was concentrated in the fraction soluble in 92 per cent methyl alcohol. The segregation of vitamin E from the antioxidant is thought to furnish the answer to the question as to whether vitamin E is itself an antioxidant or whether its presence in foods is dependent upon the simultaneous presence of antioxygenic substances which protected against oxidation.

III. *Antioxidant* (pp. 65–70).—The fraction containing the antioxidant as noted above, after removal of the methyl alcohol and water, was subjected to distillation in vacuo. The fraction distilling between 165 and 185° was found to contain the greatest amount of the antioxidant. The white crystals which appeared in this oily fraction on standing were purified by crystallization from small amounts of chloroform and formed sparkling white crystals melting at 143°. These were only slightly soluble in water and petroleum ether, moderately soluble in chloroform and benzene, and soluble in ether, acetone, and dilute alkalies. When crystallized from acetone, the crystals were prisms terminated by pyramids and were monoclinic. By combustion and molecular weight determinations, the empirical formula derived was $C_{13}H_{14}O_5$. The substance contained one phenolic hydroxyl group and formed acetyl derivatives. Its antioxygenic capacity, as determined by the method of Mattill (E. S. R., 65, p. 205), was 29.

In discussing the significance of these findings, the authors suggest that "the identification of the antioxidant as an entity separate from vitamin E may add another item to the list of essential lipids, especially if it can be demonstrated that the activity of the antioxidant is not restricted to the protection of the vitamin in food but extends to the regulation of its physiological activity."

**Rapid volumetric method for determination of potassium,** L. Clarke and J. M. Davidson (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 324, 325*).—In principle, the method described in this contribution from the U. S. Bureau of Mines consists in (1) precipitating the potassium as the acid tartrate by means of suitable concentrations of sodium acid tartrate and ethyl alcohol, and (2) dissolving the precipitated potassium acid tartrate in a known volume of standard sodium hydroxide solution and titrating the excess of the last named reagent. Two forms of the procedure are detailed, and the results of applying the method to potassic minerals are shown.

**Notes on use of glass color standards for determination of phosphorus by Denigès colorimetric method,** H. D. Chapman (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 282–284, fig. 1*).—It is the conclusion in part of this critique, contributed from the University of California, that "the use of permanent glass color standards offers a means of eliminating one of the unsatisfactory features of the blue molybdate method for the colorimetric determination of phosphorus. The color of these glass standards matches the color of the reduced phosphate solutions very well. A degree of accuracy sufficient for practical purposes can be attained if certain details pertaining to the technic of the determination are followed. . . .

"At the present time nothing can be stated regarding the permanency of these glass standards. In order to guard against the possible gradual fading which may conceivably take place, it is suggested that the values found for each color standard be checked occasionally. The use of permanent standards makes it possible to save considerable time in the routine determination of phosphorus with but little sacrifice in accuracy."

**Determination of dextrose and levulose in honey by use of iodine-oxidation method,** R. E. Lothrop and R. L. Holmes (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, pp. 334–339*).—The investigation reported upon in this contribution from the Bureau of Chemistry and Soils, U. S. D. A., covered "the effect of a number of factors governing the oxidation by alkaline iodine solutions of dextrose, levulose, and sucrose, such as time, temperature, concentration, and rate of addition of reagents, etc.; and a modification of the method of determining dextrose and levulose in honey based on the selective oxidation of dextrose is proposed.

"Under the given conditions, levulose and sucrose are oxidized only to a very limited extent. The slight oxidation of levulose is apparently due largely to the Lobry de Bruyn rearrangement, and it has been shown to be influenced by time and temperature to a considerable extent. The degree of oxidation of sucrose is small and is not influenced by time to any extent.

"Results of determination of dextrose and levulose in a considerable number of honeys by the proposed iodimetric method indicate that levulose is preponderant in normal floral honey, values for the levulose-dextrose ratio ranging from 1.02 to 1.70. Results obtained by this method and the high- and low-temperature polarization method show comparatively close agreement."

**On the detection of added water in milk and other substances,** B. DAVIES (*Jour. Sci. Instruments, 8 (1931), No. 5, pp. 160–164, figs. 4*).—The theory and constructional detail of an apparatus for the demonstration of a measurable change in the resistance of milk resulting from the addition of 5 per cent or more of water are given.

"Two electrolytic cells were arranged to form two arms of a bridge, the one containing normal milk and the other watered milk. The third and fourth arms were standard noninductive resistances. . . . It was . . . found that a very simple way of making the measurement was to vary the position of one of the electrodes rather than modify a resistance to bring about a balance, that is, to express the difference in the two milks in terms of displacement of electrode rather than in terms of resistance. This reduced the bridge to a simple form—just two equal noninductive resistances and the two electrolytic cells with an adjustable condenser of small value across either one or the other of the cells." To reduce the capacitance of the cells, which was found to have a value such as to interfere with simplicity of construction and ease of measurement, the cells were made relatively very long and narrow. It is shown mathematically that the quantity $\omega C$ or $2\pi fC$ should be made as small as possible to permit the elimination of the condenser at first placed in parallel with one of the resistances; and, to permit the satisfactory use of a telephone receiver as the null point indicator, it was considered inadvisable to reduce $f$ below about 480 cycles. A simple high frequency interrupter acting upon the bridge circuit through a small transformer was found to give "practically as good a balance as that given by the sine wave source used in these experiments."

**Studies on the chemistry of grape juice,** E. L. GREEN and Z. I. KERTESZ (*Fruit Prod. Jour. and Amer. Vinegar Indus., 11 (1931), No. 2, pp. 44–46, 57, 60*).—This is a reprint of Technical Bulletin 181 (E. S. R., 65, p. 807) of the New York State Experiment Station.

**An extractor for biological products,** C. L. SHREWSBURY (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 3, p. 320, fig. 1*).—This contribution from the Indiana Experiment Station, noting that "the extraction of large amounts of materials for use in nutrition investigations becomes a problem with the apparatus that can be fabricated or purchased," briefly describes a large apparatus of the siphoning type, of which the operation is continuous and automatic and of which the capacity is 5 liters of solvent and from 3 to 5 kg. of feeding stuffs.

## METEOROLOGY

**Weather reports,** H. W. ALBERTS ET AL. (*Alaska Stas. Rpt. 1930, pp. 3, 8–10, 26, 27, 33, 34, 39–47*).—Weather conditions during the year at the Sitka, Matanuska, Fairbanks, and Kodiak Experiment Stations are briefly described, and the usual monthly summaries of observations at 37 meteorological stations are given.

At the Sitka Station "the mean temperature for the growing season, which extends from May to September, inclusive, was 51.5° F., and the total precipitation for the same period was 28.08 in. The rate of evaporation was low. There were 16 clear days, 63 partly cloudy days, and 74 cloudy days. Because of the superabundance of moisture, the comparatively low mean temperature, and the few sunny days, weeds were kept under control with difficulty. The last killing frost in the spring occurred May 20 and the first killing frost in the fall September 23. The frost-free period was 125 days."

At Matanuska the precipitation was the heaviest since the establishment of the station in 1917. "The precipitation during August and September, 1930, was 11.45 in., or more than twice as much as the average for the same months during the 10 preceding years, and the temperature during December, 1929, and January and February, 1930, was lower than the average for the same period during the 10 preceding years." The heavy rainfall made it impossible to cultivate crops with any degree of success. "Cloudy days and unusually high precipitation were factors creating unfavorable conditions for ripening and harvesting grain and hay." The low temperature during the winter of 1929–30 in addition to the light snowfall "were probably the cause of the winterkilling of a large percentage of the fruit trees and shrubs in the experimental orchard."

At Fairbanks the fall of 1929 was favorable for harvesting and plowing. The frost-free period on south-slope lands was 115 days, May 20 to September 12, although a killing frost occurred on lowlands August 13. "Rainy weather during the latter part of May and the early part of June delayed the spring planting considerably. June was cool and wet and in consequence the crops grew slowly. Dry weather during July materially checked the growth and yield of all the crops. The quality of potatoes was improved, but the yield was materially reduced."

At the Kodiak Station on Kalsin Bay the weather during the winter was normal and favorable for livestock, but the spring was not so favorable. The minimum temperatures of February, March, and April were lower than for the same months during the 10 preceding years.

**Monthly Weather Review, [September–October, 1931]** (*U. S. Mo. Weather Rev., 59 (1931), Nos. 9, pp. 331–372, pls. 11, figs. 13; 10, pp. 373–403, pls. 22, figs. 9*).—In addition to detailed summaries of climatological data and weather conditions for September and October, 1931, solar and aerological observations, and bibliographical and other information, these numbers contain the following contributions:

*No. 9.*—A Summer Cruise in the West Indies, by R. DeC. Ward (pp. 331–339); The Genesis of a Tropical Cyclone (illus.), by F. G. Tingley (pp. 340–347); "San Nicolás"—The Tropical Storm of September 10, 1931, in Porto Rico (illus.), by F. E. Hartwell (pp. 347, 348); Investigations of the Dust Content of the Atmosphere (illus.), by H. H. Kimball and I. F. Hand (pp. 349–352); Violent Local Storm in Nevada, July 24, 1931, by J. R. Fulks (p. 353); and On the Uniformity of Symbols Used in Publications on Actinometry, by A. Ångström (p. 354).

*No. 10.*—Gap Winds of the Strait of Juan de Fuca (illus.), by T. R. Reed (pp. 373–376); Some Effects of California Mountain Barriers on Upper Air Winds and Sea-Level Isobars (illus.), by D. M. Little (pp. 376–380); Desert Winds in Southern California (illus.), by F. D. Young (pp. 380–383); Snow Cover in Southern Canada as Related to Temperatures in the North Atlantic States and the Lake Region (illus.), by R. H. Weightman (pp. 383–386); Flight of RS-1, San Antonio, Tex., to Scott Field, Ill. (illus.), by W. E. Kepner (pp. 386–388); Conical Snow, by W. A. Bentley (p. 388); Alfred Judson Henry, 1858–1931, by H. H. Kimball (pp. 388 389); and Preston C. Day, 1859–1931, by M. C. Bennett (p. 389).

## SOILS—FERTILIZERS

**[Soil investigations of the Alaska Stations]**, H. W. ALBERTS (*Alaska Stas. Rpt. 1930, pp. 8, 22, 23, 30, 31, fig. 1*).—Soil studies are here reported by the Sitka, Matanuska, and Fairbanks Stations.

Measurements of the height of the water table were made weekly from May to October, inclusive, at four points on the Sitka station reserve, three of the holes having been made in well drained to fairly well drained land, the fourth on lower land described as "uncultivated muskeg ground." The rise and fall of the water table, the measurements of which are tabulated, were found to correlate with the distribution of the rainfall for the season.

At Matanuska the Truog test (E. S. R., 43, p. 622) was used to measure the acidity of 12 samples of soils from uncut timber land and from lands cultivated from 1 to 9 years, the lands being located on three benches. The data obtained are tabulated. The cultivated soils were less acid than the timbered soils, especially those on which spruce was growing or which were overlain with moss.

Soil thermograph records from alfalfa plats at Fairbanks, the temperatures having been taken at the level of the crowns (about 1 in. below the surface) and at weekly intervals from October 8 to April 15, inclusive, are tabulated and exhibited as a graph. The soil temperature variations were much less than those observed in the air above the soil.

**[Soil investigations at the Colorado Station]**, A. KEZER and W. G. SACKETT (*Colorado Sta. Rpt. 1931, pp. 13, 14, 20–22*).—The following items are noted.

[*Critical-period studies*].—At certain periods in the growth of wheat, especially at the jointing and blooming seasons, applying water had an effect upon the yield much greater than that obtainable at other times. It is noted that this finding "has enabled many to make better use of a limited irrigation-water supply." Similarly practical use was found to have been made of the observation that soils dried out by crops and allowed to go into the winter dry are impaired in their yielding power for the following season, fall irrigation having given increases in crop returns.

*Soil deficiency tests*.—By means of the improved form of the soil plaque method, above noted, 545 samples were examined, 77.24 per cent of them showing some degree of phosphate deficiency. Of the total found more or less deficient, 56 per cent were classed as very deficient, 30 per cent as moderately, and 14 per cent as slightly deficient. Deficiency in available nitrogen was detected in 28 per cent of the samples examined.

"In the majority of cases the nitrate tests by the cornstalk method have confirmed the chemical determinations; the potash tests indicate an abundance of this material in practically all soils, but the correlation studies with the Neubauer and soil-plaque methods have not been completed. A very close agreement in calcium carbonate deficiency has been secured between the soil-plaque determination, hydrogen-ion concentration, and chemical test. The results obtained with these various methods of determining soil deficiencies have been checked with fertilizer field plats planted to sugar beets. In every case where the laboratory tests showed the need for fertilizer, increased yields have been obtained." The most profitable returns, amounting to from 1 to 5 tons an acre, followed the use of a commercial ammonium phosphate preparation.

[Determining the presence of *Clostridium botulinum* in soils].—A method has been developed which consists of testing the filtrates from the soil cultures by a complement fixation reaction, which is very specific for botulinus toxin. By employing this technique, minute quantities of poison can be detected immediately, while if the same quantity of toxin is fed to a guinea pig, the results are delayed, in many cases taking as long as two weeks. This method makes possible the examination of a large number of soils in a short time and does not involve the mortality of a large number of guinea pigs.

**[Soil research at the New York Cornell Station]** (*New York Cornell Sta. Rpt. 1931, pp. 17, 18, 19, 20, 21, 22*).—The following are included among the soil items noted.

*The effectiveness of coarse and of fine particles of limestone.*—The four grades, 5–10 mesh, 10–25, 50–80, and 200 mesh were used. These grades were applied at the three rates of 4, 2½, and 1¼ tons to the acre. An 11-year period of cropping indicated that effectiveness in raising crop yields increased in the order 5–10 mesh, 10–25, 200 mesh, and 50–80 mesh. However, "crop yields from the 10–25 mesh limestone were so little below those from the 50–80 mesh as to suggest that if the stone were ground so that all particles would pass a 10-mesh sieve, which must of necessity carry with it a considerable proportion of finer material, this would be as fine as it would be profitable to grind."

*The decomposition of crop residues.*—Residues from timothy, maize, and red clover were studied. It was shown by means of laboratory nitrification observations that the red clover residues brought about a slight depression in soil nitrate concentration during the first incubation period, the maize material a greater effect, and the timothy a marked depression in all cases, the decreases in soil nitrate concentration being accompanied by increases in bacterial numbers and in carbon dioxide production. Experiments with water extracts of timothy residues showed that soluble organic matter is more effective in interfering with nitrate accumulation than is the insoluble fraction. By lowering the carbon-nitrogen ratio by means of additions of sodium nitrate, carbon dioxide production was increased.

*Chemical and botanical studies of muck soils.*—The muck soils thus far examined have been found relatively high in calcium content, acid in reaction, and, in their surface layers, composed largely of deciduous and coniferous residues.

*Effect of organic residues in muck soils.*—Despite the distinctly organic character of these soils, the incorporation of plant residues caused depression in the rate of nitrate accumulation, especially in muck soils tilled for some years. As in the mineral soils above noted, timothy residues had a greater and more prolonged effect than had those from clover.

*Mull and duff in the forests of northeastern United States.*—In addition to mull (E. S. R., 64, p. 612), duff is proposed as the other main type of humus layer. "This group is taken to include all the different types or shades of 'raw humus,' and in addition an intermediate type common in the ordinary northern hardwoods of the region on not especially favored localities. The name root duff is proposed to designate this type. It is a thin layer of unincorporated humus, most of it well decomposed, resembling a detritus mull but strongly matted together by a dense root mat. Other more pronounced duff types distinguished are leaf duff, greasy duff, and fibrous duff. The two last-named are essentially softwood types."

*Forest litter and course of humus formation.*—"Litter of the principal forest trees of this region has been tested for acidity, buffer ability against acids and bases, and content of lime and other ash constituents. Corresponding tests have been made on humus formed under different trees, under conditions otherwise comparable as far as possible. The results have corroborated previous experience in so far as very pronounced differences have been found in a number of cases between the litter of different species. Some evidence also has been obtained showing that these differences are reflected in the humus formed under different trees. On the other hand, the variations in buffer ability within the same kind of litter are in certain cases very marked, and there is no such difference between the hardwoods and the softwoods of the region as has been found in Europe.

"The greatest buffer ability against acids and the highest content of bases were found in litter of 'exacting' hardwoods such as tulip poplar. The lowest buffer ability against acids was found in hemlock, although, curiously enough, the lime and the general base content of the hemlock litter are not lower than for many of the hardwoods."

*Nitrification in forest soils.*—It was found that nitrification occurred even in the most pronounced forms of duff encountered within the region, active nitrifying organisms having been found in these types at a higher acidity (pH 2.9) than seems previously to have been recorded.

"The mulls always seem to contain active nitrifying organisms, whereas in the most pronouced forms of duff there is a high proportion of samples which have shown no nitrification in the tests. This general difference between mull and duff is in accordance with previous experience."

The morphology of a nitrite organism cultivated from a typical crumb mull was also studied. The organism grew as an extremely compact zoogloea. Even in the crumb mull studied, "the nitrate organisms commonly found in agricultural soils (growing in culture largely as free cocci) do not seem to play any rôle. The data are insufficient at present, but they seem to point to the probability" that zoogloeae are the normal agents of ammonia oxidation in forest soils, contrary to the situation as found in agricultural soils.

**[Soil and fertilizer trials]** (*South Carolina Sta. Rpt. 1931, pp. 28–37, 56, 105, 106, 107, 114, 115, figs. 7*).—The following items are noted.

*Effect of calcium arsenate on the productivity of certain soil types*, H. P. Cooper et al.—Frequent applications of calcium arsenate designed to control the boll weevil markedly depressed the yield of some crops. Calcium arsenate in quantities ranging from an application of from 25 to 100 lbs. on Norfolk sand up to treatments amounting to from 250 to 2,500 lbs. to the acre on Davidson clay loam showed itself capable of serious effects upon such coarse-textured, gray sandy soils as the Norfolk and Durham series. The fine-textured, dark colored Greenville, Cecil, and Davidson series were not affected seriously by such quantities of the arsenate as are commonly applied as insecticide.

Report is made also of pot tests, of trials of $\frac{1}{100}$-acre plats of Cecil clay loam at the station, and of tests of iron sulfate treatment to precipitate the arsenate as an insoluble salt. Liming was more or less effective in lessening the damage, and precipitation of the arsenate as an insoluble iron compound was of use. The soils of a low reactive iron content were much more readily impaired in productiveness than were the red soils of high iron content.

*Sand drown or magnesium deficiency in cotton*, H. P. Cooper.—Magnesian limestone, potassium fertilizers containing magnesium, and magnesium sulfate were found by the Sandhill Substation to avert the effects of magnesium deficiency.

*Use of limestone*, H. P. Cooper.—"Since much of the soil in the State is too acid for the successful production of many crops," halves of certain plats at the Sandhill Substation were limed, with the effect of improving yields.

Dolomitic limestone as a component of fertilizers for soils which have not been limed was found to pay rather more than its cost.

*A study of the relationships between the mineral content of the soil and plants grown on the soil*, J. H. Mitchell.—"The phosphorus content of plants is increased by fertilization. In the case of legumes such as clover and vetch the addition of lime apparently aids in the assimilation of phosphorus. Ammonium sulfate applied at the rate of 300 lbs. per acre increased the nitrogen content of rye, oats, and clover from 20 to 40 per cent. Where lime was used a much smaller increase was noted. Somewhat similar results were obtained with nitrate of soda." No effect of salts of copper, zinc, or manganese was shown.

*Fertilizer experiments*, H. P. Cooper and R. W. Wallace.—Results of trials at the Sandhill Substation with lime, potassium and lime, and nitrogen are briefly reported.

*Soil fertility investigations*, J. E. Adams.—At the Sandhill Substation the general trend is toward the depletion of the soil organic matter, not only of that added by means of the green manures and cover crops but also of that present at the beginning of the experiment. There appeared definitely to be a rapid conversion of organic nitrogen to the available form, resulting in a rapid loss of plant food during seasons of heavy rainfall. "This was much in evidence during the summer of 1929, the crops actually lacking available nitrogen before the growing season was over."

*Soil improvement studies*, C. S. Patrick.—Work already noted has been continued (E. S. R., 64, p. 616).

**[Vermont Station research in soil chemistry]**, J. L. Hills (*Vermont Sta. Bul. 332 (1931), pp. 12–14*).—The following studies are briefly noted.

*Hydrogen-ion concentration, base exchange, etc., in soils*.—An extensive study made during the past year has shown that it is relatively easy to "over-lime" certain soils. "An acid soil with an addition of only one-half of its lime requirement often produces a much better crop growth than the same soil receiving the full lime requirement. When two or more times the lime requirement is added, the soil seems to possess certain definite toxic properties." It is noted that while liming recommendations are seldom, if ever, made in excess of the lime requirement of the soil, these recommendations are for the soil to a depth of about 7 in. If this lime be so applied as to remain nearer the surface, certain soil areas may receive more than their full lime requirement.

"Rape, flax, alfalfa, clovers, and even lettuce, which is a very high lime-loving plant, are all greatly depressed on overlimed acid soils." In seeking the cause of this yield depression, it was found that "while . . . calcium bicarbonate, nitrite, and ammoniacal nitrogen are greatly increased on the acid soils heavily limed, as compared with the same soils lightly limed, yet it is very doubtful that this is the direct cause of this toxicity, because plants grew very well in water and sand cultures containing these substances in concentrations far greater than those found in the overlimed soils. Neither does it seem to be due to a lack of available nutrients, since complete fertilizers containing large amounts of soluble phosphate, manganese, and iron gave very little, if any, benefit. Since good growth can be produced on heavily limed calcareous soils and even pure limestone itself, it would not seem to be due to the basicity of the overlimed soils. In many instances, limestone alone produced better crop growth than a mixture of acid soil and limestone.

"Certain silicates, especially the calcium and magnesium forms when applied in large amounts, greatly relieve this toxic condition. This is also true when heavy applications of plant residue or farm manure is used. This would indicate that these materials act as 'buffers' and help prevent this toxic condition." It is recommended that very acid soils, unlimed for some years, be limed a year or two before planting alfalfa or sweetclover, and it is further suggested that added organic matter would be of use where such soils are to be seeded immediately after liming.

*Downward movement and fixation of phosphorus and calcium in soils.*—In a preliminary study of the factors affecting the penetration of soils by phosphatic materials applied in field tests on three soil areas, both ammonium and sodium phosphates moved toward the feeding root zone much more readily than did superphosphate. The crop yields, however, were as good with the superphosphate as with the more soluble sources of phosphorus

**A bacteriological method for determining mineral soil deficiencies by the use of the soil plaque,** W. G. Sackett and L. C. Stewart (*Colorado Sta. Bul. 375 (1931), pp. 36, figs. 19*).—The soil plaque, utilizing the spontaneous development of Azotobacter colonies as a plant-food indicator, has proved to be a satisfactory means of determining deficiencies in phosphorus, lime, and apparently available potash, in soils containing an adequate inoculum of Azotobacter. In the cases of soils having a pH value lower than 6.8, an inoculation of *Azotobacter chroococcum* was added after treating the soil with calcium carbonate sufficient to correct the acidity. The following condensed statement presents the essential features of the procedure:

"Four plaques are prepared from each soil under examination, 50 gm. being used for each plaque. Energy material in the form of either cornstarch or sucrose is added to all of the plaques. The first of these is reserved without further treatment for a check, the second receives $K_2SO_4$, the third $Na_2HPO_4$, the fourth $K_2HPO_4$, and a fifth plaque with $CaCO_3$ may be made to test for lime deficiency. Sufficient distilled water is added to each to make a soft, plastic mass which is transferred to a small culture dish and molded into a smooth-surfaced plaque. The four plaques, which constitute the set, are placed in a moist chamber and incubated for 72 hours at 30° C. At the end of this period, Azotobacter colonies, visible to the naked eye, will have appeared on the plaques where the deficiency has been satisfied or where none existed, while no growth will be present where the proper limiting factor has not been supplied. The relative colony development on the untreated check and the fertilized plaques indicates the degree of the deficiency."

Tests with fertilizers applied according to the indications of the soil-plaque method demonstrated the accuracy of the method. The superiority in the matter of the time requirement of the soil-plaque method (72 hours) over the Neubauer method (E. S. R., 53, p. 319), in which the test is completed in about two weeks, and over the field plat experiment is pointed out.

**The soil versus the solution method as a means of studying bacterial activities in soil,** J. E. Greaves and H. C. Pulley (*Jour. Agr. Research [U. S.], 43 (1931), No. 10, pp. 905–917, figs. 3*).—As in the earlier work (E. S. R., 57, p. 713) of which the experiments noted in the present contribution from the Utah Experiment Station are a continuation, one of the soils used was a sample of a highly productive calcareous loam artificially converted into nonproductive "alkali" (saline) soil by the addition, singly and in combinations of two or of all three of the salts, sodium chloride, sodium sulfate, and sodium carbonate. Samples of the same soil in its natural, productive state, and samples also of naturally saline or saline-alkaline soils, leached and unleached, were included among the experimental materials. H-ion concentrations ranged from pH 8 to 10.3, and the replaceable calcium, magnesium, potassium, and sodium varied widely in the different soils and to a less extent in the variously treated soils.

Of the experimental findings it is stated, in part, that "when the soils were inoculated into peptone solution the production of ammonia varied with the specific soils and the incubation period. It was slow, then rapid, followed by a slowing down of the process and a decrease in ammonia, probably due to its transformation into protein nitrogen. The ammonia accumulation varied, depending upon the specific soil, its treatment, and the incubation period. It would appear that an incubation period of from one to seven days may be used. . . .

"The greatest accumulation of nitric nitrogen occurred between the nineteenth and twenty-first days, but the greatest variation in nitric nitrogen accumulation occurred on the fifteenth day. Consequently, if one wishes to obtain the maximum accumulation of nitric nitrogen in solutions an incubation period of 21 days should be used, but if one wishes to learn the relative rate of nitric nitrogen accumulation in alkali soils an incubation period of 15 days should be used. By using an incubation period of 15 days one gets a fair correlation between solution and soil method. One may at times conclude from results obtained that soluble salts in concentrations of 2 per cent destroy the nitrifying ferments, a conclusion that is shown to be erroneous when the results obtained in solutions are examined. The ammonifying, nitrifying, and nitrogen-fixing ferments withstand 2 per cent of sodium sulfate, sodium carbonate, or sodium chloride in soil for long periods. All soils studied showed gains in nitrogen, both by the soil and by the solution methods. However, the gains were usually greater when the determinations were made by the soil-tumbler method than when they were made by the solution method."

**The importance of soil conservation,** H. H. BENNETT (*North Carolina Sta. Agron. Inform. Circ. [63] (1931), pp. [1]+12*).—This is an address delivered July 29, 1931, before the North Carolina Farmers' and Farm Women's Convention, at Raleigh, N. C., discussing work on soil erosion and run-off losses carried out by the U. S. D. A. Bureau of Chemistry and Soils with the cooperation of the North Carolina among other stations. The nature of the problem and of the means available for its solution are indicated, together with some results already attained at various points throughout the country.

**Commercial fertilizers,** L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 334 (1931), pp. 29*).—The usual analyses are reported.

Of all the brands licensed, 96 per cent were of the "high-analysis" type (14 per cent or more of actual plant food), in which the actual plant food was found to cost about 10 cts. per pound, as against 13.8 cts. per pound for the plant food in the seemingly cheaper low-priced goods. All of the liming materials, and the fertilizers with but few exceptions, were found as good as they were claimed to be.

**Methods of calculating fertilizer mixtures,** J. F. LUTZ (*North Carolina Sta. Agron. Inform. Circ. 61 (1931), pp. [1]+8*).—This is a popular statement of the simpler methods of calculating the quantities of materials required in fertilizer mixtures.

## AGRICULTURAL BOTANY

**Studies in growth, senescence, and rejuvenescence in plants,** B. N. SINGH and K. KUMAR (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), pp. 308, 309, 310, 311*).—Two physiologically distinct groups are distinguished. with brief discussion. one of such short-lived annuals as *Pisum sativum, Coriandrum sativum, Carum copticum, Foeniculum vulgare, Trigonella foenum-graecum, Hibiscus esculentus, Cicer arietinum, Raphanus sativus*, and *Sinapis* sp., and another of such long-lived annuals as *Dhulia neglectum* and two species of beans.

Using respiratory index as the measure of the metabolic activity in protoplasm, the author states that a decline in the katabolism and multiplication of the cells in the growing region will tend to approximate to the gradient of the hydration of the protoplsam (the meristems), that the potential longevity of any plant is determined by the relative rates of anabolic and katabolic activities and the hydration state of the protoplasm in the growing region, and that the state of hydration in the growing region appears to govern both respiration and growth.

The drop in tissue respiration and the hydration preceding the inception of the reproductive system in the two types of plants and a periodic fall and rise before and after the production of each crop of blooms and bolls in the cotton plant are attributed to a change in the concentration of the respirable substrate.

It is concluded that density and not size should be the criterion depended upon in the selection of crop-plant seeds such as were used (*Raphanus sativus gigantum*).

**Studies in growth, senescence, and rejuvenescence in plants. -The relative distribution of growth and growth materials in the whole plant and its parts at successive stages of development in the long beans,** K. Kumar (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *pp. 301, 302*).—"This paper deals primarily with relative growth rate as measured by increase in surface and dry weight production at successive intervals of a week throughout the ontogeny of the long beans grown under field conditions." The results of analysis are detailed.

**Quantitative aspects of the problem of growth and differentiation,** H. S. Reed (*Internatl. Cong. Plant Sci., Ithaca, N. Y. Proc., 1926, vol. 2, pp. 1095–1106, fig. 1*).—Growth in plants is influenced by many interdependent factors, yet the growing organism can coordinate a multiplicity into unity, emerging finally as the integrated product. A rational interpretation for growth is furnished by the application of a few simple principles. The essentials appear to be conditioned by a slow transformation of materials in a way proportional to time and resembling transformations known in other systems.

The length of a lateral is measurably a function of its ordinal position on the branch bearing it, which situation is related to its time-relation, and this holds between the different parts of the tree. To understand the laws of development necessitates knowledge of these relationships. "With the results at hand it seems logical to regard the problem of differentiation as a process which leads to a definite distribution of matter in space."

**The factors concerned in the relative sizes attained by the shoot and the root in herbaceous plants,** A. Lal (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *p. 302*).—In the present investigation to determine the relative sizes attained by the shoots and roots of fully matured plants in different habitats, it was found that the root: shoot ratios are typical for a given habitat and for a given species and are independent of the final sizes attained by the plants. The ratios are higher in harder soils, which are likely to show lower moisture content than is found in softer cultivated soils or in low-lying situations. They remain constant for a large number of species growing in the same habitat. In different species they are independent of the final sizes attained by the plants.

It is concluded that the approximate constancy of the ratios in different species growing in the same habitat, in spite of varying sizes of the plants, indicates clearly that the relative sizes of the shoot and the root are normally determined by internal factors affecting the distribution of growth and growth material in different organs.

**Studies in the anatomy and morphology of the composite flower, I, II,** M. F. Koch (*Amer. Jour. Bot., 17 (1930), Nos. 9, pp. 938–952, pls. 2, figs. 4; 10, pp. 995–1010, pls. 2, figs. 5; abs. in New York Cornell Sta. Rpt. 1931, p. 42*).—It is said to be possible, as a result of these investigations on the Compositae, to show the relations between the ray, bilabiate, and disk corollas, and to throw some light on the relationships of the group.

*I, The corolla.*—The relation of ray corolla to the disk corolla is considered, and the gross morphology of the corolla and the floral anatomy of Aster and Solidago are discussed, the results being particularized for various forms. The ray corolla is a modification of the disk corolla, showing the same fundamental structures.

*II, The corollas of the Heliantheae and Mutisieae.*—No anatomical relationship was made out as to the connection of the Compositae with any other group which has been considered as closely related. The closest resemblance to a composite type appeared in the Calyceraceae. However, *Boopis anthemoides*, in that group, shows only those similarities that are common to gamopetalous corollas in which vascular reduction is taking place.

**The morphology and anatomy of the inflorescence and flower of the Platanaceae,** L. E. Boothroyd (*Amer. Jour. Bot., 17 (1930), No. 7, pp. 678–693, pls. 2, figs. 7; abs. in New York Cornell Sta. Rpt. 1931, p. 40*).—In this study of the fundamental nature of the flower and inflorescence of the Platanaceae, Platanus is said to have actinomorphic, generally unisexual flowers with mostly free parts alternating in whorls of three or four. These are separately discussed.

The inflorescence is said to be fundamentally a panicle, its main branches having been reduced to form the heads and the end of the inflorescence also being fused to form a head. This compression has led to great reduction of the bracts and flower parts. Further reduction has resulted in the loss of all the heads but the basal one in *P. occidentalis*. The modification of the flower and inflorescence are supposedly adaptively related to wind pollination. The taxonomic position of Platanus is supposed to be somewhere near the more primitive members of the Rosaceae, on the basis of flower and inflorescence structure.

**The vascular anatomy of the flower, with refutation of the theory of carpel polymorphism,** A. J. Eames (*Amer. Jour. Bot., 18 (1931), No. 3, pp. 147–188, figs. 29; abs. in New York Cornell Sta. Rpt. 1931, p. 41*).—The theory of carpel polymorphism is shown to be without basis in anatomy.

**Studies in the respiration of tropical plants,** B. N. Singh (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), pp. 306, 307, 308, 309, 310*).—Three papers are presented.

*The mechanism of respiration in fleshy plant organs which offer great organizational resistance to the exchange of gases and store a large stock of carbohydrate reserves: Part I, Analysis of the respiration drift in air and nitrogen and their ratio AN/A at different temperatures, as also the "air-nitrogen" and "nitrogen-air" after-effects in green oranges.*—In a study of the effect of temperature on the natural course of respiration in air and nitrogen in massive plant structures, such as green oranges, it was found that the nitrogen respiration was remarkably higher than the air respiration at all experimental temperatures, this fact being in marked contrast with the result of previous observations on leaves of *Artocarpus integrifolia* or *Eugenia jambolana*. A study, employing temperatures of from 15 to 40° C., of the natural drifts and transitions in respiration showed that, apart from the continuously higher rate of nitrogen respiration, the initial temperature values in both respiration types tend to increase.

"Up to 30°, both the air and nitrogen respirations depict no decrease in time for 24 to 52 hours, and the values, instead of showing a decrease (as observed in the Artocarpus or Eugenia leaves), show, on the contrary, a progressive rise. This drifting increase in the $CO_2$ output during the senescent stage of the orange is ascribed to a progressive rate of hydrolysis to produce greater respirable substrate consequent to an enhanced rate of $CO_2$ effusion due to a lowering in the organizational resistance of the orange material. At 35°, an appreciable fall in both the respirations manifests itself in time, clearly indicating that at this critical temperature the active sugars just begin to fall short of the requirements, and the supply of the sugars is not controlled by the 'harbinger enzymes' or the hydrolytic enzymes. At 40°, a disturbance in the general form of the curves sets in, and this is attributed to the 'high temperature effect' which seriously affects the respiratory system."

*The mechanism of respiration in fleshy plant organs which offer great organizational resistance to the exchange of gases and store a large stock of carbohydrate reserves: Part II, Localization of a shift in the working of the respiratory system with the march of age in the knol kohl tubers.*—It is suggested on the basis of results given in some detail "that increase in the nitrogen-respiration is an accompaniment of greater supply of effective sugars, and a parallel decrease in the air respiration is due to the working back of part of the intermediate substance preceding the stage of the $CO_2$ and water production; while, on the other hand, a reversion of the system will result in the decrease of the nitrogen respiration accompanied by a parallel increase in the air respiration, the whole of the latter phase being governed by the rate of hydrolysis of the higher carbohydrate reserves."

*A search into the nature of the sugar substratae in respiration; effect of different sugars on the respiration of Artocarpus integrifolia leaves.*—It is claimed that earlier work has given many-sided confirmations of the view that sugars form the respirable substrate. The present investigation analyzed the effects of glucose, levulose, and sucrose solutions on a failing system of respiration in the leaves of *A. integrifolia* in an attempt to ascertain the nature of the respiration substrate.

Following the injection of different sugars into the leaves at different starvation stages, respiration intensity usually at first rises, decreasing later, even during continuous injection of sugar. This is discussed. Of the sugars injected, glucose gave the maximum carbon dioxide, levulose and sucrose slightly less.

**A proposal of a schema for the dynamic systems involved in the respiration of oranges and knol kohl tubers,** B. N. Singh (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *pp. 305, 306, fig. 1*).—A graphic representation is given, showing both down-grade (splitting) and upgrade (synthetic) processes.

**Studies in the respiration of mango-leaves, with special reference to Blackman's oxidative anabolism,** S. Ranjan and N. K. Chatterjee (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *p. 305*).—A very brief account is presented of a study which has been undertaken of the respiration rates of mango leaves of various ages. The study, though it did not stress the respiration quotient, brought out the actual differences between the $CO_2$ output and the $O_2$ intake of the leaves at different ages. An explanation of the high oxygen intake is mentioned as possible.

**A new intermittent ozone apparatus,** S. Ranjan (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *p. 304*).—The essential feature and the working of a new method for the intermittent production of ozone are outlined. Ozone is found to have a depressing effect on the rate of respiration.

**The problem of carbohydrate transport in plants—A glucose effect on the permeability of cell membranes to sugar molecules as studied by the intensity of respiration when leaves of Artocarpus integrifolia were injected with varying concentrations of glucose solution,** R. S. INAMDAR and K. V. VARADPANDE (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *pp. 300, 301*).—This investigation developed as the result of a study of respiratory intensity when the leaves were injected with glucose solutions of varied concentration. The curves obtained could not all be explained on the basis of simple relations between concentration and respiratory intensity. Observations on respiration rates recorded simultaneously on control and on experimental leaves gave curves, equations from which usually work out in a very simple way and are expressible as simple logarithmic curves. For comparing the relationship between the concentration of sugar solutions and the respiratory intensity, the initial values obtained by extrapolating these curves to zero time have been plotted against corresponding concentrations. The generalized curves thus obtained at different temperatures show an ascending and a descending phase. The descending phase has been explained in terms of the water factor in the cell. The ascending phase forms the special feature of the present communication. The respiration increases relatively faster than the concentration. This is explained in terms of the relatively greater diffusion rate of sugar molecules as concentration increases, suggestions regarding which fact are offered.

**The problem of water-balance in tropical plants, I, II,** R. S. INAMDAR and B. M. DABRAL (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *pp. 299, 300*).—This study is in two parts.

I. *The daily equivalence of transpiratory loss of water under varying intensities of atmospheric conditions.*—As a result of a measurement of the transpiration from different potted plants in comparison with that from a free-water surface, it was found that when a maximum daily value of transpiration has been reached a subsequent increase in the intensity of atmospheric conditions has no influence on the transpirational water loss. In the natural habitat conditions of a place like Benares this leads to an equivalence of daily water loss per unit area of the transpiring surface. Observations are said to show that this equivalence of daily water loss is due to the hourly regulation of the rates of transpiration during the day when the evaporating conditions rise above a certain value.

"Investigations under graded intensities of evaporating conditions have shown that transpiration increases directly with an increase in the intensity of evaporating conditions only till a maximum value (which is about one-fifth the value of the evaporating conditions of the habitat) is reached."

II. *The water-balance in different stages of growth in the mustard plant.*—Observations indicate no reason to assume that the rates of transpiration in the tropical plants are abnormally high in correspondence with the prevailing high intensities of evaporating conditions.

An extension of previous relevant observations on mature plants to growing plants of mustard and an analysis of the records made indicate that the average hourly rates of transpiration per unit area for the day period remain constant from day to day during the whole period of growth except for a very short period after germination. Where these plants are grown, evaporation from a free-water surface decreases from October to December.

This equivalence of daily water loss is a result of the limit set by root absorption, the ratio dry weight of the root: transpiring leaf area remaining constant throughout growth.

"The *T/E* values go on increasing as the growing season advances toward winter as the daily values of evaporation continue to decrease in general in this season."

**Manganese, an essential element for a green alga,** E. F. HOPKINS (*Amer. Jour. Bot., 17 (1930), No. 10, p. 1047; abs. in New York Cornell Sta. Rpt. 1931, p. 41*).—In addition to work previously noted (E. S. R., 66, p. 419), it has been demonstrated that Ba, Cu, Pb, Sr, Zn, B, Ni, I, As, Co, and Al, all in concentrations of 1:5,000,000, will not replace manganese in the nutrition of *Chlorella* sp.

**Boron in irrigation waters,** C. S. SCOFIELD and L. V. WILCOX (*U. S. Dept. Agr., Tech. Bul. 264 (1931), pp. 66, pl. 1, figs. 5*).—Sufficient boron was found in certain irrigation waters of southern California to cause injury to various crops, including citrus and walnuts, the leaves of which rather than the fruit or stems seemed to accumulate the excess boron. Injured walnut or citrus leaves frequently contained 10 times as much boron as normal leaves. The severity of the injury was influenced by local soil and climatic conditions, by methods of irrigation, quantity of water used, and the fertilizer program. Species differed considerably with respect to boron tolerance. Irrigation waters containing more than 0.5 parts per million of boron may injure such crops as lemons or walnuts, and if containing more than 1 part per million may injure other plants. The authors point out that boron is probably a normal plant constituent.

Analyses are presented of various irrigation waters showing their content of various salts, and their conductance as a measure of total salinity. In some cases it is believed possible to segregate from irrigation uses the chief sources of boron contamination, and in other cases to introduce sufficient uncontaminated water to reduce the boron content below the point of injury.

**The problem of abnormal growths on pines** [trans. title], [C.] VON TUBEUF (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 5, pp. 225–251, figs. 25*).—A review is given of abnormal knobby developments in different parts of various conifers, with more particular description of knot formations on branches and stems of *Pinus sylvestris*. The formations are provisionally regarded as natural sports, no adequate cause being at present assignable.

**On the formation of secondary-spores within the pore-tubes of Ganoderma lucidus and Ganoderma applanatus,** S. R. BOSE (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), p. 279*).—"Possibly, external conditions determine to a large extent the formation of basidia in such specimens of *G. lucidus* and *G. applanatus*."

**The relation between seeds and accompanying microflora, Part I,** T. R. SATHE (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), p. 305*).—Investigation having failed to give proof of relation between specific bacteria on seed and any influence on their germination, the author carried this work further to determine any part played by the accompanying microflora during the early stages of the seedlings. Complete sterilization of the seed proved difficult. Counts and distributions of organisms were studied. Seeds of *Ardisia crispa* were brought under investigation to study the hereditary symbiotic association of bacteria.

**Some changes in the weed flora of Whatcom County, Washington,** W. C. MUENSCHER (*Torreya, 30 (1930), No. 5, pp. 130–134; abs. in New York Cornell Sta. Rpt. 1931, p. 42*).—This area was originally covered with dense coniferous forests. After the land was cleared, many weeds migrated into the area. This paper presents a discussion of the behavior of these weeds during the past 25 years.

## GENETICS

**Chromosome numbers and taxonomy,** O. Heilborn (*Internatl. Cong. Plant Sci., Ithaca, N. Y., Proc., 1926, vol. 1, pp. 307–310*).—That chromosome numbers may be of great value in taxonomic studies appears from several investigations, data from which are discussed in connection with the author's own work.

**Chromosome numbers in Ulmus,** R. I. Walker (*Science, 75 (1932), No. 1934, p. 107*).—An examination at the University of Wisconsin of flower buds of *U. pumila*, *U. fulva*, and *U. americana* revealed 15 haploid chromosomes in the first two species and 28 or 30 in the third.

**Chromosomes and phylogeny in Crepis,** L. Hollingshead and E. B. Babcock (*Calif. Univ. Pubs. Agr. Sci., 6 (1930), No. 1, pp. 1–53, figs. 24*).—In connection with genetic and taxonomic studies of Crepis, an examination of as many species as could be brought into cultivation has progressed for about 10 years (E. S. R., 61, p. 326; 62, p. 723).

The authors consider that the view that gross morphological differences between plants, as contrasted with such cytological features as number and morphology of the chromosomes, are the only definite measure of progress in evolution, is too limited; and they hold that the importance of the chromosomes, especially their appearance in somatic cells at mitotic metaphase, as an index of taxonomic relationship, has become increasingly evident as the number of species of Crepis examined has increased.

As a general result of the attempt, here noted, to indicate the present state of knowledge resulting from studies regarding number and morphology of the somatic chromosomes in about 70 species of Crepis, in which studies size differences, the occurrence of satellites, and shape as determined by spindle-fiber attachment were used to distinguish the various chromosomes, it is stated that in each of the several sections of the genus morphologically similar species have similar chromosomes. The authors consider such study of chromosomes to be of value in relation to taxonomy. There is said to be a close parallelism in Crepis between number and morphology of the chromosomes and phylogenetic relationship.

**Cytological investigations of hybrids and hybrid derivatives of Crepis capillaris and Crepis tectorum,** L. Hollingshead (*Calif. Univ. Pubs. Agr. Sci., 6 (1930), No. 2, pp. 55–94, pls. 3, figs. 19*).—In relation with the investigation above noted, a cytological investigation of the same material was attempted. This included studies of the somatic and meiotic chromosomes of the parental species and of reciprocal hybrids. The occurrence of several triploid hybrids provided material for a study of these and some of their progeny. These studies are detailed with tabulations.

**Macrosporogenesis and the development of the macrogametophyte of Lycopersicon esculentum,** D. C. Cooper (*Amer. Jour. Bot., 18 (1931), No. 9, pp. 739–748, pls. 3, figs. 2*).—Examinations at the Wisconsin Experiment Station of buds and mature flowers of the Bonny Best and Greater Baltimore tomatoes revealed 12 haploid chromosomes. As seen on the equatorial plate the chromosomes were divided according to size into eight large and four small pairs. In no case were there less than four macrospores produced, and in all cases the chalazal spore became the functional embryo sac mother cell, the other three disintegrating. The embryo sac was divided into seven cells, the three cells of the egg apparatus at the micropylar end, the three antipodals at the chalazal end, and a large binucleate primary endosperm cell.

**The antiscorbutic vitamin of apples, IV,** M. B. Crane and S. S. Zilva (*Jour. Pomol. and Hort. Sci., 9 (1931), No. 3, pp. 228–231*).—This paper is a continuation of the series by Bracewell et al. (E. S. R., 65, p. 896.)

Attention having been called to the fact that the Bramley Seedling apple is a triploid variety having 51 chromosomes in contrast to the other varieties tested, which belonged to the class of diploids with 34 chromosomes, two further triploid varieties of authentic origin, the Belle de Boskoop and the Blenheim Orange, were tested for their vitamin C content. Both proved potent sources of vitamin C, the Belle de Boskoop being as rich as the Bramley Seedling. The vitamin C potency of the Blenheim Orange, although high, did not exceed that of Lane Prince Albert, a diploid variety.

"The above evidence, although suggestive of a connection between the high vitamin C content and the high chromosome number in the apple, is by no means conclusive. The investigation of a greater number of triploid varieties is necessary before definite information can be obtained."

**Cytological studies on irradiated tissues.—I, The influence of radium emanation on the microsporogenesis of the lily,** M. Levine (*Internatl. Cong. Plant Sci., Ithaca, N. Y., Proc., 1926, vol. 1, pp. 271–297, pls. 7*).— Study which was made on the effect of filtered and of unfiltered radium emanation on the cells at various stages in the development of the sporogenous tissue in the anthers of *Lilium harrisii*, *L. giganteum*, *L. auratum*, and *L. superbum* stresses the effect of the emanation on the early stages. The effects of small doses of radium emanation on the nuclei, nuclear division, and cytoplasm in young cells of the sporogenous tissues of the anther are noted, and the effects of filtered and of unfiltered radium emanation on the principal stages in the development of the pollen mother cell, and especially the injury to the chromatin material in the various division stages, are described.

**Investigation in cytology,** B. McClintock, H. Creighton, and C. R. Burnham (*New York Cornell Sta. Rpt. 1931, p. 40*).—A study of a pair of maize chromosomes showing certain visible differences demonstrated that the two members of the pair exchange portions simultaneously with a crossing-over of the factors known to be associated with them. The mutual interchange of segments between nonhomologous chromosomes was demonstrated in maize through a study of the morphology of the chromosomes in a semisterile strain.

**Recent findings in cytology of fruits (cytology of Pyrus III),** B. R. Nebel (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 406–410, pls. 2*).—A list, presented of the chromosome numbers in various species and varieties of apples and of pears, shows with one notable exception, namely, Wellington Bloomless (41+1?), that the chromosomes occur in multiples of 17. The author suggests the possibility that postdiakinetic clumping in the diploids and triploids may mean homology, but suggests that this clumping may be mechanical in origin.

**The independence of genetic factors governing size and shape in the fruit of Cucurbita pepo,** E. W. Sinnott (*Jour. Heredity, 22 (1931), No. 12, pp. 381–387, figs. 3*).—An examination of the progeny of crosses made at Columbia University between two pure lines of *C. pepo* differing markedly both in fruit size and fruit shape indicated that for the material under study there was a single factor for shape and a series of multiple factors for weight, and that factors controlling shape in this species are independent of and different in character from those controlling total size or volume. The particular dimensions of the fruit are believed to be merely resultants of the interaction of these shape and volume factors. In the special cross involved there was a sharp monohybrid segregation for shape into three-fourths disks and one-fourth spheres in the $F_2$ generation.

An earlier paper on the subject was noted (E. S. R., 58, p. 425).

**A productive thornless sport of the Evergreen blackberry,** G. M. Darrow (*Jour. Heredity, 22 (1931), No. 12, pp. 404–406, figs. 2*).—A brief account is given of a thornless blackberry found growing wild in Oregon, which, from the fact that thorny canes occasionally appear from the roots, is believed to be of chimeral nature, that is, a thin layer of thornless tissue overlies the original thorny tissue of the cane.

[**Studies of the physiology of reproduction and lactation**], S. A. ASDELL (*New York Cornell Sta. Rpt. 1931, pp. 30, 31*).—Brief accounts are given of studies of mammary development in which two hormone preparations were found to induce full mammary development in a mature virgin spayed rabbit, and to bring a virgin goat into milk; studies of attempted early diagnosis of pregnancy in the cow by the detection of leakage of erythrocytes into the vagina at the time of implantation of the embryo and by the Zondek-Aschheim method with immature rats and rabbits, with negative results in both cases; and studies of the formation of spermatozoa in the testes of rabbits by inducing degeneration of the spermatozoa and spermatids through the introduction of the testes into the abdomen.

**Exchange of oestrin and corpus luteum hormones in parabiotic female rats**, R. T. HILL (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 866–868*).—In cases of pregnancy of one female of a parabiotic union the corpus luteum secreted in one female almost entirely inhibited the occurrence of oestrum and partially stimulated hypertrophy of the mammary gland in the nonpregnant twin. The oestrous cycles were, however, more or less independent in the united animals.

**Effect of corpus luteum extracts in suppressing ovarian activity in the rat**, H. T. GRABER and R. A. COWLES (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 977–979*).—The intramuscular injections of extracts of corpora lutea to mature female rats was found to extend the length of the oestrous cycle from 4 to 5 days in normal controls to as long as 13 days in the experimental animals. Extracts of thymus and anterior lobe of the pituitary were given to the controls. The results indicated that the corpus luteum extracts contained some factor which directly inhibited ovarian activity, and that this effect was not merely due to an impairment of the general bodily metabolism.

**Effect of theelin upon the developing ovary of the rat**, E. A. DOISY, J. CURTIS, and W. D. COLLIER (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 885–887*).—In a study of the effect on ovarian development of theelin, a hormone isolated from the urine of pregnant women, 21-day-old rats were given subcutaneous doses of 3 rat units daily and others received a single dose of 20 rat units. Theelin severely retarded the normal growth of the ovaries and caused a hydropic condition of the germinal epithelium, and only a few follicles appeared when normally many were present 4 weeks after the experiment started. A single heavy dose caused the hydropic degeneration earlier, but the animals largely recovered with a more rapid growth rate in the ovary and the appearance was normal, although they were 10 days later than normal animals in ovulating.

**Difference between gonad-stimulation by extracts of pregnancy-urine and of pituitary body**, Z. WALLEN-LAWRENCE and H. B. VAN DYKE (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, p. 956*).—In comparative studies of the gonad-stimulating properties of extracts of pregnancy urine and of the pituitary body, 146 female and 206 male rats were injected with 4 daily doses, beginning at 21 days of age, with autopsy at 26 days of age. It appeared from studies of the weights of the ovaries in females and the weights of the seminal vesicles and coagulatory glands in males that either there are sex-specific gonad-stimulating principles or that the gonad-stimulating principle of the hypophysis is different from that of pregnancy urine.

**The luteinizing substance of pregnancy urine,** P. A. KATZMAN, L. LEVIN, and E. A. DOISY (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 9, pp. 873, 874*).—Administration of pregnancy urine to adult female rats produced an almost complete state of oestrum for from 5 to 10 days, with inhibition of oestrum for from 5 to 12 days following the cessation of the injections. The ovaries of such animals contained large numbers of corpora lutea. The ovaries of pregnant rats were similarly affected, and parturition was delayed by administration of urine from pregnant animals. Injections of pregnancy urine into ovariotomized pregnant rats caused no delay in parturition, and the delay is considered due to the luteinization of the ovary.

## FIELD CROPS

**Practical plant breeding on a theoretical basis,** W. DIX (*Praktische Pflanzenzucht auf Theoretischer Grundlage. Neudamm: J. Neumann, 1931, pp. VII+251, pls. 4, figs. 15*).—This book presents information on the principles and practices involved in the several phases of crop plant improvement, as modified by advances in pure and applied genetics and related lines of research.

**The variability of the results of field experiments and their statistical treatment** [trans. title], J. ŠIMON (*Sborn. Výzkumn. Úst. Zeměděl. Repub. Českoslov. (Rec. Trav. Insts. Recherches Agron. Répub. Tchécoslov.), No. 40 (1929), pp. 201, pls. 5; Ger. abs., pp. 178–186*).—The statistical treatment of results of field experiments as applied to the yields in extensive tests with two potato varieties is discussed in detail, and a list of 320 titles is appended.

**[Field crops experiments at the Alaska Stations, 1930],** H. W. ALBERTS (*Alaska Stas. Rpt. 1930, pp. 7, 10–13, 14, 15, 16, 27–30, figs. 5*).—Experiments (E. S. R., 64, p. 731) reported on in these pages included variety tests with wheat, barley, oats, rye, seed flax, potatoes, beets, mangels, carrots, alfalfa, sweetclover, clover, forage mixtures, and miscellaneous grasses and legumes; cultural trials with potatoes; and crop rotations.

**[Field crops work at the Georgia Coastal Plain Station, 1930],** S. H. STARR (*Georgia Coastal Plain Sta. Bul. 16 (1931), pp. 8–47, 59–63, 76–80*).—Experiments with field crops reported on as heretofore (E. S. R., 64, p. 622) for the current season and for various periods included variety trials with oats, wheat, rye, barley, cotton, corn, peanuts, soybeans, winter field peas, vetch, sweetpotatoes, tobacco, and miscellaneous grasses and legumes; fertilizer tests with oats, corn, cotton, peanuts, soybeans, velvetbeans, sweetpotatoes, potatoes, and tobacco; green manuring and liming tests with oats, corn, and cotton; cultural (including planting and harvesting) experiments with oats, wheat, cotton, peanuts, winter field peas, vetch, sweetpotatoes, and potatoes; crop rotations for tobacco; steam sterilization of tobacco beds; pasture studies; and a study of color inheritance in sweetpotatoes. The breeding work with corn and the forage crops and pasture tests were in cooperation with the U. S. Department of Agriculture, and the tobacco experiments were in cooperation with the Department of Agriculture and the Georgia College of Agriculture.

**[Field crops and plant breeding investigations in New York]** (*New York Cornell Sta. Rpt. 1931, pp. 19, 58–62, 95–97*).—Breeding work with corn, wheat, oats, barley, beans, potatoes, and cabbage, and genetic studies are reviewed, together with brief accounts of results obtained in potato experiments dealing with ecological factors affecting yield and quality, adaptation to muck soil, green sprouting, fertilizers, and strains.

In crop sequence studies, wheat started better after soybeans than after oats, although the final yields were about the same. The nitrate content of the soil differed little during the growth of oats and of soybeans and remained practically constant after the oats were harvested, but increased decidedly after the soybeans. After early removal of soybeans the nitrate content of the soil was high in the fall and low the next spring, a condition resulting in relatively high yields of wheat and low yields of corn. Conditions and results were reversed, however, following the late removal of soybeans. The depressing effect of late removal of soybeans on the wheat yield was overcome by applying sodium nitrate at the time of planting the wheat. Wheat was superior to buckwheat and corn as a preceding crop for oats. The effect of the cereals on crops that follow was explained by their direct or indirect effect on the nitrate content of the soil.

**Outline of agronomy work being conducted in North Carolina** (*North Carolina Sta. Agron. Inform. Circ. 62 (1931), pp.* [2]+*32, fig. 1*).—Practical results in agronomic research at the station, substations, and elsewhere in North Carolina, often in cooperation with the U. S. Department of Agriculture, reviewed in this pamphlet, are outlined from investigations on soils, soil fertility, fertilizers and amendments, and in improvement, variety, cultural, rotation, harvesting, and technological studies with farm crops. Fertilizer and crop production and rotation demonstrations are listed.

**[Field crops experiments in South Carolina]**, H. P. Cooper, B. E. G. Prichard, W. B. Rogers, R. E. Currin, W. B. Albert, E. C. Elting, J. P. LaMaster, J. H. Mitchell, A. M. Musser, J. H. Beattie, J. D. McCown, E. E. Hall, S. J. Watson, J. E. Adams, R. B. Carr, and C. S. Patrick (*South Carolina Sta. Rpt. 1931, pp. 22–25, 26–28, 38–40, 46, 47, 57, 58, 79, 80, 89–91, 95–99, 107–112, 115, 116, figs. 8*).—Agronomic experiments (E. S. R., 64, p. 625) at the station and substations included variety trials with corn, wheat, oats, barley, rye, sorghum, sorgo, velvetbeans, sweetpotatoes, soybeans, cowpeas, Crotalaria, lespedeza, and pasture grasses; fertilizer tests with corn, oats, soybeans, potatoes, sweetpotatoes, tobacco, and pasture; a study of chlorosis of oats and cowpeas due to low manganese content of the soil; cultural (including planting) tests with corn, sweetpotatoes, tobacco, and pasture; intercropping of legumes and corn; a study of the possibilities of a soybean-small grain rotation by the use of mechanical power; and crop rotations. Fertilizer formulas are recommended for bright flue-cured tobacco and for plant beds.

A fertilizer ratio experiment with soybeans at the Sandhills Substation in cooperation with the U. S. Department of Agriculture showed a general trend toward a depletion of the organic matter on virtually all plats, even on those receiving continuously a full green manure crop or hay crop. A complete fertilizer seemed necessary for soybeans. When each plant food element was considered alone, nitrogen produced the best growth and was followed by phosphorus and then potassium. Potassium deficiency was apparent on areas receiving no potassium.

Production of green material on pasture followed rainfall very closely but was about 14 per cent greater on limed than on unlimed series. There were no marked indications that any fertilizer treatment influenced the percentages of either organic or inorganic components of the grass.

Comparisons of methods of preparing cut-over coastal lands for seeding to pasture grasses showed that in the second and following years the advantages of the prepared areas over unprepared ones are intensified by probably a 6 to 1 better stand at the beginning and the lack of competition with native grasses and bushes which are largely killed during preparation. Carpet grass and Dallis grass seemed better adapted than other grasses to conditions of the Coastal Plain section, although centipede and Bahia grass both thrived on the lighter and better drained soils. On carpet grass indications were that split applications of readily available nitrogen in conjunction with single applications of phosphorus and potassium produce the most total growth and lengthen the grazing season. In both 1930 and 1931 carpet grass and lespedeza responded very markedly to 200 lbs. of 16 per cent superphosphate broadcast on the soil shortly after seeding.

**Crop rotation and tillage experiments at the San Antonio (Texas) Field Station,** G. T. Ratliffe and I. M. Atkins (*U. S. Dept. Agr. Circ. 193* (*1931*), *pp. 40, figs. 2*).—Experiments (E. S. R., 47, p. 429) reported on for the period 1909–1929 were made to determine the crops best suited to the region, desirable crop sequences, and the effects of various cultural practices on crop yields. Information is also given on the agriculture of the region, the soil, climatic conditions, and on cotton root rot (*Phymatotrichum omnivorum*).

The annual yields showed that oats is not satisfactory for the region unless it can be used for pasture besides for hay or grain. Corn, milo, forage sorghum, and Sudan grass have made satisfactory yields. Corn and milo both were good grain crops, although the sorghum midge and birds have reduced milo yields in many years. Cotton yields have been very low in recent years because of disease and pests.

Oats yielded practically as much under continuous cropping as in rotations. The production of this crop has been handicapped seriously by leaf rust and stem rust. The yields of corn correlated very closely with rainfall received from November to July. Corn yielded best in a 2-year rotation with early summer plowing following oats. Fall plowing after cotton produced better yields of corn than late winter plowing.

Milo made its highest yields in 4-year rotations, and yields in 3-year rotations came next, while continuous cropped milo produced relatively low yields. Sorghum for forage yielded more in 8-in. drills than in 4.1-foot rows, and the quality of hay was also superior. It produced higher yields when alternated with corn in a 2-year rotation than when alternated with cotton, both in rows and in 8-in. drills. Sudan grass slightly outyielded sorghum, and its hay was of better quality.

Cotton yields generally were higher in rotations than under continuous cropping. Rotations longer than 2 years did not appear more productive than 2-year cycles. Cotton yields were low following sorghum, especially in 2-year rotations of these crops. Records on cotton root rot disease (E. S. R., 42, p. 449; 45, p. 246; 61, p. 446) indicated that of all the crop sequences and cultural practices included in the rotation experiments, increasing the time between the recurrence of cotton in the cycle is the most effective factor in reducing the loss from this disease. Root rot was much more destructive in continuous cropping than in rotations, and was more extensive in 2-year rotations than in 3-year and 4-year rotations.

Fallowing land between alternate crops of oats, corn, cotton, or sorghum was found undesirable on shallow land with gravel stratum; yields of corn and cotton were much below average, sorghum yields were no better than in rotations, and oats yields were not enough above average to justify the practice. In general, early plowing proved to be desirable; corn and cotton yields were increased by early preparation. Bordering to prevent run-off of rainfall was not found to be of practical value. Corn and cotton in a 2-year rotation on border plats yielded below average, and sorghum when alternately cropped and fallowed on these plats produced no more than in rotations

Applications of barnyard manure increased the yields of milo, forage sorghum, and cotton, and depressed the yields of oats, but did not influence corn yields. Neither green manure nor subsoiling consistently increased the yields of cotton or of the other crops, and in some instances tended to lower them.

**[Agronomic and plant breeding work of the Landsberg, Prussia, Experiment Station]** DENSCH, A. KÖNEKAMP, W. HEUSER, ET AL. (*Jahresber. Preuss. Landw. Vers. u. Forschungsanst. Landsberg a. d. Warthe, 1929–30, pp. 17–61, 92–108, figs. 7; 1930–31, pp. 10–47, 66–80, fig. 1*).—Research reported on for 1929–30 and 1930–31 resembled earlier investigations (E. S. R., 63, p. 436) in general scope.

**[Cotton research in South Carolina]** (*South Carolina Sta. Rpt. 1931, pp. 25, 26, 44, 45, 52–54, 56, 93–95*).—Further investigations with cotton (E. S. R., 64, p. 628) comprised variety, cultural, fertilizer, and cover crop tests; physiological and fiber studies; and seed treatments.

Continuing their study on factors influencing growth and development of cotton buds and bolls, G. M. Armstrong and W. B. Albert determined that defoliation of branches appreciably reduced the final size of bolls and average weights of seed and lint. Shedding of bolls increased as the result of early defoliation, ringing, or removal of leaves adjacent to fruit buds 5 to 7 days before blooming. The experiments showed the great dependence of the boll on the green tissues adjacent to it and also that transport of materials from a distance takes place.

In a study of the length and structure of fibers by H. W. Barre, Armstrong, and C. C. Bennett, the fiber arrays of individual seed suggested the possibility that the 24 to 26 groups of different lengths obtained may have been derived from the fibers which grow from the seed coat daily, i. e., each group may have been produced roughly in a period of 24 hours. The fibers were found to grow very rapidly for the first week and then less rapidly to 24 to 27 days but were still elongating slowly at 30 days. The fibers at the large end of the seed were appreciably longer than those at the tip end Although the longest fibers practically ceased growing at 30 days, the arrays showed that other fibers must continue to elongate until maturity of the boll at 50 days. That the shorter fibers at 25 days of age were not due to breakage of the immature fibers was shown by microscopic examination of many fibers of different lengths. The volume and surface area of the seed increases only very slightly after 25 days of age, suggesting that few new fibers are produced thereafter from the surface area. Conclusions were that the changes in the distribution of the different lengths of fibers from 25 to 50 days must be due to the increased growth in length of many of the shorter fibers.

The weights of 300 fibers of each length revealed that the short fibers are heaviest per unit length, i. e., the longest fiber is the finest fiber. This holds in the boll 25 days old as well as in one 50 days old. The outer bolls on the limbs were found to have larger percentages of short fibers and were less uniform in distribution than bolls at the first position on the limbs. The arrays indicated that bolls with practically the same percentage of lint might vary considerably in the uniformity of the fibers. Rather striking variations in fuzziness of the seed coat were observed and studied.

The oil content of cottonseed, according to studies by H. P. Cooper and J. H. Mitchell, is related more closely to variety than to fertilization.

Cultural and cover crop experiments were made at the Pee Dee Substation by E. E. Hall and S. J. Watson. Machine-delinted seed dusted with an organic mercury compound gave an increase in stand of 19.4 per cent and acid-delinted seed an increase of 37 per cent, while other dusts with varying strengths gave results ranging from a decrease of 6.2 per cent to an increase of 21.2. Spacings with one plant per hill 6, 9, and 12 in. apart have given about the same average yield and the most seed cotton at first picking. Plantings from April 1 to 15 usually have given best returns. Indications were that broadcast seeding may give satisfactory results on land poor to medium in fertility and reasonably free from grass and weeds. Hairy vetch and monantha vetch again led cover crops in the production of nitrogen for cotton. It was evident that a good crop of cotton could be produced after a winter cover crop with but little or no side dressing.

**Root development as related to character of growth and fruitfulness of the cotton plant,** F. M. Eaton (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 10, pp. 875–888, figs. 2*).—When plants of Pima Egyptian and Acala upland cotton in cans containing 110 kg. of soil were grown normally, i. e., with both branches and bolls, the mean ratios of the weight of roots to tops were, respectively, 0.22 and 0.17; with branches but no bolls, all floral buds removed as appeared, 0.53 and 0.44; and with neither branches nor bolls, the lateral buds of the main stalks removed as appeared, 0.57 and 0.62. The boll development of fruiting plants was dominant over both root development and vegetative growth. With plants grown without bolls, the roots increased proportionately in weight more than did the tops, but the increase in the weight of roots was approximately proportional to the increase in weight of stalks and branches. The weights of roots of plants grown without bolls were nearly triple those of control plants.

The proportionate weights of the roots and tops of plants grown one in a pot and those of plants grown two in a pot differed little. The ratio of the weight of the roots to the weight of the tops of plants allowed to wilt frequently was slightly lower than of plants in a soil maintained at nearly optimum moisture content. See also an earlier note (E. S. R., 65, p. 331) on the reactions of cotton to defloration and defruiting.

**Studies in Indian pulses.—II, Some varieties of Indian gram (Cicer arietinum L.),** F. J. F. Shaw and A. R. Khan (*India Dept. Agr. Mem., Bot. Ser., 19* (*1931*), *No. 2, pp. 27–48, pls. 3, figs. 2*).—The second contribution in this series (E. S. R., 61, p. 222) describes and classifies 59 types of gram collected throughout India in 1924. It supplements earlier work (E. S. R., 36, p. 635) dealing with the biology of the plant and describing 25 types isolated from samples from the United Provinces and around Pusa.

**Lentils of the Union of Socialistic Soviet Republics and of other countries: A botanic-agronomical monograph** [trans. title], E. I. Barulina (H. Barulina) (*Trudy Prikl. Bot., Genet. i Selek.* (*Bul. Appl. Bot., Genet. and Plant-Breeding*), *1930, Sup. 40, pp.* [*1*]+*319, pls. 3, figs. 102; Eng. abs., pp. 265–304*).—This monograph treats of the history, distribution, botanical relationships, and anatomy of lentils, especially *Lens esculenta*, the characteristics of species and varieties, classification, cultural and culinary values, and insect pests and diseases. *Vicia ervilia* and its varieties and *V. monantha*, sometimes referred to as lentils, are also discussed, with comments on vetch as a weed in lentils.

**Changes in the chemical composition of mangels and rutabagas during storage,** K. S. Morrow, R. B. Dustman, and H. O. Henderson (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 10, pp. 919–930, figs. 3*).—Mangels and rutabagas stored at the West Virginia Experiment Station for 3 months after harvest lost moisture continuously and at a fairly uniform rate. At the end of storage the dry matter content of mangels had increased 2.58 per cent and of rutabagas 2.73 per cent, equivalent to relative gains of 32.7 and 30.5 per cent, respectively, and large enough to be important in the calculation of feeding values. A study of the changes of the constituents of the dry matter during storage showed considerable variation between the two types of roots, and when the mangels and rutabagas were considered separately, year-to-year variations were found to exist. As an average for 3 years, the most pronounced changes in the relative composition of dry matter of rutabagas were loss of nitrogen-free extract and, to a lesser extent, of crude protein. With mangels, however, the greatest relative change was a loss in crude protein. The dry matter and the protein content of the dry matter were related inversely in mangels but not in rutabagas.

**Comparisons of apparently healthy strains and tuber lines of potatoes,** D. FOLSOM, F. V. OWEN, and H. B. SMITH (*Maine Sta. Bul. 358 (1931), pp. 104, pls. 4, figs. 15*).—Comparisons of commercial strains of Green Mountain, Irish Cobbler, Spaulding Rose, and Bliss Triumph potatoes, of tuber lines selected within a commercial strain, of commercial strains described as being tuber lines, and of strain v. other conditions as a cause of difference are reported on, with a rather comprehensive review of similar tests made by others. The technic of such comparisons is considered in some detail, and important observations as to method are noted. The general practical conclusions drawn from the comparisons may be summarized as follows:

With respect to yield rate, weight or size of tuber, and type of tuber, commercial strains were significantly different in some instances, although their relative rank was not consistent from year to year. Strain differences generally were smaller than differences due to other conditions, such as degeneration diseases, fungicides, season, fertilizer, variety, and planting method, and did not exceed differences due to such conditions as location in the field and selection of overweight seed tubers. As to yield rate, selection of high-yielding v. low-yielding tuber units had no significant effect the next year and very little in the second year. Tuber selection for type likewise gave results that were practically useless. Conclusions were that, under the conditions of the comparisons, one healthy commercial strain is not to be preferred to another, and that tuber unit selection is not to be recommended, at least in commercial practice.

**Approved practices for Irish potato growers,** B. F. FULTON, H. B. MANN, R. F. POOLE, and R. SCHMIDT (*North Carolina Sta. Bul. 279 (1932), pp. 7*).—Information on varieties, seed, seed treatment, soils, fertilization, cultural methods, harvesting and storage, and on the control of insects and diseases is presented for growers of potatoes in North Carolina.

**The effect of sulphuric acid treatment on the germination of sugar beet seed,** F. HANLEY and R. M. WOODMAN (*Jour. Soc. Chem. Indus., Trans., 49 (1930), No. 19, pp. 215T–220T*).—Treatment of sugar beet seed with sulfuric acid of approximately 80 per cent concentration led to a statistically significant increase in germination under experimental conditions at Cambridge University. Germination also was more rapid with acid-treated seed, suggesting that this treatment has useful possibilities in insuring a quick and even stand. Determinations at the date of singling indicated that acid treatment did not lead to reduction in the average dry weight per seedling.

**Agricultural seed,** A. S. LUTMAN (*Vermont Sta. Bul. 336 (1931), pp. 7*).—Significant findings in the analysis for purity and germination are described for 250 samples of agricultural seed collected from dealers in Vermont during 1931.

**The yellow rattle as a weed in cultivated land and meadows** [trans. title], F. FÜRST (*Wiss. Arch. Landw., Abt. A, Arch. Pflanzenbau, 6 (1931), No. 1, pp. 30–141, figs. 28*).—The characteristics, botanical relationships, distribution, and adaptation of yellow rattle are described from extensive studies, its harmful effects on crops are indicated, and methods for its control are outlined, with a list of 121 references.

**Weed control** (*Colorado Sta. Rpt. 1931, p. 28*).—The chlorates, especially sodium chlorate, were found the most effective and promising of commercial weed killers tested. Calcium chlorate was nearly as effective as sodium chlorate. Three applications killed perennial weeds, although in some cases one was enough. Mouse-ear poverty weed and bindweed were killed most easily, and Canada thistle and Russian knapweed were next, but white weed so far resisted treatment. The efficiency of chlorates was favored by the acidity of the soil, acidifying water used in making the spray, and the use of nozzles giving a very fine spray, whereas irrigation or the removal of the tops after treatment materially lowered or even prevented the action of the spray.

## HORTICULTURE

**[Horticultural investigations at the Alaska Stations]**, H. W. Alberts (*Alaska Stas. Rpt. 1930, pp. 3–7, 8, 13, 14, 15, 31, figs. 2*).—Brief reports are presented on the behavior of various fruits, vegetables, and ornamental plants.

At the Sitka station, a hybrid between the Alaska crab (*Malus rivularis*) and the cultivated apple (Keswick) bore for the first time, producing fruits about twice the size of those of the crab parent. Covering the fruit of the Black Tartarian and Montmorency cherries with canvas lessened the tendency to crack but prevented ripening. Studies in strawberry improvement were continued, a total of 280 strains being tested. A brief account of the history, distribution, and uses of the native strawberry (*Fragaria chiloensis*) is given. Clubroot developing in the station plantings of cabbage was partly checked by applications of 4 tons of air-slaked lime per acre. Lesser applications were ineffective.

Canning pea studies at the Matanuska Station showed an average acre yield of 2,078 lbs. of shelled peas for nine plats. When graded 24 per cent of the product fell into grades 1 and 2, 66 per cent into grades 3 and 4, and 10 per cent into grades 5 and 6. Alaska peas planted May 28 and June 4 reached the proper stage for canning, but later plantings failed to reach this stage.

At the Fairbanks Station Cuthbert raspberries heavily mulched with straw came through the winter to produce a fine crop.

**[Horticulture at the Colorado Station]**, E. P. Sandsten (*Colorado Sta. Rpt. 1931, pp. 39, 40*).—Crosses between the Valencia and Brown Australian onions yielded some promising seedlings the characters of which indicated that the dark brown, thick skin of the Brown Australian variety is dominant. Locally grown onion seed was not only more productive but yielded fewer doubles and scallions. The quality of onions at the time of storing was the main factor in their keeping. It was found that topping should be delayed for from 4 to 5 days after pulling, and that field curing should last from 7 to 12 days. All injured, diseased, and immature onions should be discarded and the sound onions stored in crates in well-ventilated storage.

Attempts to develop tipburn-resistant varieties of lettuce showed some progress, but difficulty was met in combining resistance with size and firmness of the head.

A red sport of the Delicious apple found at Cedaredge was also firmer and better keeping than the parental variety. Tests with vinifera grapes indicated that certain of these types can, with proper attention to sites and cultural practices, be grown in Colorado.

**[Horticulture at the Georgia Coastal Plain Station]** (*Georgia Coastal Plain Sta. Bul. 16 (1931), pp. 47–58, 64–75*).—A progress report (E. S. R., 64, p. 630) is presented on the results of varietal, cultural, and fertilizer tests with various vegetables and fruits.

As shown in average yields for three years, 1928–1930, Clark Early was the most productive tomato. During the period 1924–1930, 3-ft. spacing of tomatoes resulted in the largest yield of marketable fruit, and in the three years 1928 1930 1,600 lbs. of a 4–8–4 (N–P–K) fertilizer proved more effective than lesser amounts. Of four sources of potash for tomatoes, muriate gave the largest yields.

Of many watermelons tested Stone Mountain led in yield of marketable product. A fertilizer of 6–8–8 (N–P–K) is recommended for watermelons, and kainite gave promising results as a potash fertilizer.

In a variety test of asparagus Washington produced the largest crop.

Listed as the most productive varieties of fruit are the Imperial peach, the Wickson plum, the Diamond grape (bunch type), the Hunt grape (muscadine type), Young dewberry, Improved Lady Thompson strawberry, Celeste fig, and Mersereau blackberry. Moore was the most productive pecan.

**[Horticulture at the South Carolina Station]** (*South Carolina Sta. Rpt. 1931, pp. 77–79, 80–83, 95, 96, 103–105, figs. 4*).—Apple pollination studied by A. M. Musser and F. S. Andrews showed Grimes to be a good pollinizer for Delicious, Ben Davis, Yates, and Winesap. For the first time in four years Delicious pollen gave a satisfactory set on Golden Delicious. When only one bloom was left on a spur, the percentage set was much greater than where no blooms were removed. Flowers pollinated with compatible varieties set better and started developing more rapidly than did selfed blooms or blooms pollinated with incompatible varieties. In case of favorable pollination embryo development accompanied the first swelling. Where no swelling occurred within 6 to 10 days after pollination, abscission followed, and an examination of the drops showed a degeneration of the embryo sac. Winesap pollen did not dehisce normally but was held in masses with what are believed to be the remnants of the topetum layer or undifferentiated sporogenous tissue. A drying sufficient to liberate the pollen from the anthers of other apples did not release Winesap pollen.

L. E. Scott and Musser report that in fertilizer experiments with peaches at the Sandhill Substation the no-nitrogen trees were conspicuous because of their weak growth and poorly colored cover crops.

As found by R. A. McGinty, Scott, and Musser, fertilizer applied to asparagus after harvest at the rate of 1 ton of 5–7–5 (N–P–K) per acre gave the most profitable yields. Precutting applications were not as effective, but when the application was halved and applied before and after cutting good results followed. The omission of any one of the three principal elements decreased yields. Spacing plants 2 ft. apart and 3 ft. between rows gave the largest yields, but the spears were smaller and cultivation more difficult than with wider spacings.

McGinty and Andrews, studying factors influencing the yield of Fordhook bush Lima beans, found that increases in the nitrogen content of fertilizers increased seed weight but had no significant effect on the number of pods or seeds. Individual plant selections showed rather wide variation as to height, spread, time of maturity, and pod and seed characters. An examination of blooms showed that the pollen grains do not dehisce under ordinary conditions, and that some of the grains germinate within the anther and perhaps function in fertilization.

Working with a spineless strain of okra, McGinty found that individual plants differed. Strains of any given variety of cabbage were found to vary with respect to size, shape, and time of maturity. The better strains of Copenhagen Market were practically as early as Jersey Wakefield but were not so hardy, necessitating spring seeding.

Scott found that a spring application of 1,400 lbs. per acre of high magnesium lime increased the growth of a summer crop of cowpeas in the peach orchard approximately 100 per cent. The Young dewberry proved promising. Manure applied in the hill to watermelons gave better results than commercial fertilizer, which delayed and sometimes prevented germination and where plants survived checked their early growth. Hale Best, Bender Surprise, Kilgore Hummer, and Abbott Pearl cantaloupes were best among 13 tested.

Fertilizer, time of planting, and spacing tests with sweetpotatoes are briefly reported.

**[Horticulture at the Vermont Station]** (*Vermont Sta. Bul. 332 (1931), pp. 18, 19, 22–26*).—A list is given of self-pollinations and cross-pollinations accomplished in the spring of 1931, with results expressed in number of fruits set. Measurements made on the growth of pollen tubes in the pistils of self- and reciprocally-pollinated Bartlett and Guyot pear flowers are tabulated. In general pollen tube development proceeded quite rapidly at first in both self- and cross-pollinated blooms, but later there was a retardation and checking in the selfed tubes. In attempting to develop a technic for dissecting out the pollen tubes it was found that a combination of acid fuchsin and light green stains showed the tubes quite clearly. Nitric acid and potassium chlorate dissolved the middle lamella between cells and permitted their separation. A sugar-agar solution of 1.5 per cent agar and 12 per cent sugar gave good pollen germination. In the pear varieties Phelps, Serotina, Pulteney, Pullver, Winter Bartlett, and Chretien Hiver over 70 per cent germination was secured. Some undeveloped pollen grains were observed in the case of Serotina. Slow growth of the tubes rather than poor quality of pollen is believed to underlie self-sterility.

Determinations of the acidity, sugar, and moisture contents of 34 samples of cherries are continued (E. S. R., 65, p. 534).

**[Vegetable crops studies by the New York Cornell Station]** (*New York Cornell Sta. Rpt. 1931, pp. 93–95, 98, 99*).—Chemical analyses of celery harvested at different stages of growth showed no causal relationship between the carbohydrate-nitrogen ratio in young plants and their tendency to form seed stalks. Changes in chemical composition associated with seeding are considered the effect rather than the cause of changed seeding habit.

The use of paper mulch increased the total yield and hastened the ripening of muskmelons, peppers, and tomatoes and returned a profit, but with early cabbage, beets, and snap beans the yields were slightly depressed. The soil was slightly warmer at 3- and 6-in. depths under paper, and the moisture content was higher in the upper 12-in. layer. Nitrate nitrogen determinations in 1930 showed that paper mulch markedly increases nitrification.

Studies on Long Island showed that as to soil reaction a pH range of 4.8 to 5.4 is best for potatoes, pH 5.5 to 6.6 for cauliflower, and that pH 4.5 to 5 is harmful for peas, onions, lettuce, beets, carrots, and spinach. Snap beans were tolerant to acidity, although the yield increased as the pH rose from 4.5 to 5.5. Cauliflower varieties differed in their acidity response, suggesting the possibility of developing strains for special soil conditions. Asparagus responded more markedly to nitrogen than to any other element, and manure was not profitable on this crop, despite large yields. Onions growing on muck soil which normally produced thin-skinned, poorly colored bulbs were improved in color and thickness of the skin by heavy applications of superphosphate.

Finding that peas shipped from Western States commanded a premium over New York-grown peas, a study was made of the situation and showed considerable low-grade stock in New York shipments. The icing of western peas tended to retain quality. Much inferior fruit was found in locally grown tomato shipments in the Geneva, Rochester, and Buffalo markets. There were found no marked differences between tomatoes ripened in light and in darkness, and little or no difference in chemical composition was found between tomatoes harvested at the green ripe stage and ripened in storage and those taken fully ripe from the vine. Hubbard squashes stored at 65° F. developed an extremely thick and hard shell as compared with those held at 40°. The flesh of the 40° lot was lighter in color, but the losses in weight during storage were considerably greater at 65°.

**Place-effect influence in the Robust pea bean**, E. V. HARDENBURG (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 495–497; abs. in New York Cornell Sta. Rpt. 1931, pp. 101, 102*).—Certified seed produced in New York in 1928 was planted in 1929 in California, Colorado, Maine, Nebraska, and New York under various conditions of climate and soil moisture. Samples of the seed from the resulting crops were reassembled at Ithaca for comparative study. As determined by measurements of length, width, and thickness, the shape differences in the seed from the several locations were found to be small, in most cases insignificant. There was some indication that the drier climate produced somewhat smaller and flatter beans. Yields as determined in four replicated plats at Ithaca in 1930 showed significant differences in only two comparisons, namely, between Nebraska dry land and Colorado irrigated seed and between Nebraska dry land and Maine grown seed.

**The new "Ohio Canner" table beet**, R. MAGRUDER (*Ohio Sta. Bimo. Bul. 154 (1932), pp. 18–25, figs. 4*).—From crosses between selected mother beets of the Deep Blood Turnip and Chicago Market varieties there were selected seedlings of uniform shape and solid dark red flesh. From these by inbreeding and further selection there were developed three promising strains, the best of which was designated Ohio Canner and is herein technically described.

**Experiments in controlling the growth habit of sprouting broccoli**, J. E. KNOTT (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 366–369; abs. in New York Cornell Sta. Rpt. 1931, p. 102*).—In greenhouse and field experiments at the New York Cornell Experiment Station it was found that the removal of the center apical bud of sprouting broccoli while it was yet vegetative decreased the yield during the first two months of harvest, although the side shoots were increased in size. No relation was noted between the size of the head and yield; in fact, by the end of four months of harvest the total yield was the same whether the large central head had been allowed to develop or all the growth had been forced into side shoots. The practical suggestion is offered that in order to obtain maximum yields no heads should be allowed to remain on the plant after they have begun to bloom.

**[Pomology studies at the New York Cornell Station]** (*New York Cornell Sta. Rpt. 1931, pp. 82–86*).—Observations upon fruit trees growing on various types of soil showed in some cases less injury from the drought of 1930 than resulted in earlier years from excess moisture. New roots penetrated more deeply than usual. Roots apparently differed in their response to excessive soil moisture according to the season, suffering much more in the period of active spring growth than in fall or winter. Excessive soil moisture during summer may also cause serious injury. Trees planted shallowly in locations where others had died grew well.

Sweetclover planted at intervals from June to September made satisfactory growth in all cases. Even where left uncut it caused no injury to the trees, which bore better colored foliage than did those in nonleguminous sod. Trees grown in alfalfa made practically as good growth as did those in cultivation. Early plowing followed by a cessation of cultivation on June 1 compared favorably in terms of tree growth with early plowing and cultivation continued until July 15 or September 1, but when plowing was delayed until June 1 later cultivation proved beneficial. Unfavorable results obtained in orchards receiving good care were often traced to poor soil drainage.

The most important benefit from pruning is believed to lie in the development of a strong framework for the tree, and though heavy pruning reduces early production it is deemed necessary in order to train the tree. Mature trees did not require pruning every year. The excessive pruning of 5-year-old trees was followed by severe blight injury as compared with that in lightly pruned trees, and in mature Wealthy and Wagener trees more than three-fourths of the crop was lost from blight following heavy pruning. Winter injury in the roots of apples and buds of peaches in the relatively mild 1929–30 season was apparently due to a decreased storage of reserves, inasmuch as chemical analyses showed very low starch.

As related to fruit bud formation, starch storage at an early period favored initiation. However, high nitrogen alone did not necessarily prevent fruit bud formation on trees that had the habit of forming flowers. The ringing of 20-year-old hitherto unfruitful Northern Spy trees resulted in an abundant bloom the succeeding year.

Bees apparently showed a preference for certain varieties of apples. Hand pollination, sufficient to insure a satisfactory crop, was accomplished on 20-year-old McIntosh trees in less than one hour.

The red color of Baldwin, McIntosh, and Northern Spy was found to increase if the harvested fruits were exposed to sunlight for from 10 to 30 days. Fruits with little or no color at harvest did not redden as rapidly as did those with 10 per cent or more of color. It is warned, however, that exposure in warm weather must necessarily reduce keeping quality.

The premature browning of the centers of stored apples, previously reported as occurring first in fruit held at 29° F., appeared first in 1930 in apples held at 36°.

**Progress in the survey of orchard conditions,** A. J. Heinicke (*N. Y. State Hort. Soc. Proc., 76 (1931), pp. 111–116; abs. in New York Cornell Sta. Rpt. 1931, p. 87*).—The data from experimental plats on different soil types showed the yield from trees on good soils to be twice those of trees on medium soils, and from 10 to 12 times those of trees on poor soils. While the poor soil may be sufficiently good to support tree growth, the difficulty arises from the failure of the trees to produce blossoms and set fruit with sufficient regularity to make an orchard enterprise profitable under such conditions. Internal drainage of the soil is especially emphasized as a predominating factor. On moderate to good soils excellent care and special precautions may prove profitable, but where the soil conditions are fundamentally unfavorable such care will probably be of little benefit. The data indicate the importance of increasing the humus supply of the better soil types.

**Difference in soil and tree growth within limited areas,** A. J. Heinicke and L. P. Batjer (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 69–74, fig. 1; abs. in New York Cornell Sta. Rpt. 1931, p. 87*).—Striking differences were observed in the growth of 800 young York Imperial apple trees planted on a plat of ground with the surface soil apparently uniform and were found to be conspicuously related to the subsoil conditions. Physical analysis of the soil profiles indicated that the percentage of total colloids of the subsoil was especially high in those parts of the plat where the tree growth was poorest. There was also a close relation between the rate of percolation of water through different soil profiles and the character of the tree growth. Water leached through a soil column of standard length five times as rapidly in the case of good as of poor soil. The use of draintiles did not overcome the unfavorable soil conditions.

**The possibilities of hand pollination in the orchard on a commercial scale,** L. H. MacDaniels (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 370–373; abs. in New York Cornell Sta. Rpt. 1931, pp. 87, 88*).—Pollination experiments during the spring of 1930 showed that hand pollination has commercial possibilities, especially in the case of valuable varieties. The results in a number of orchards indicated that a marked increase in yield may be obtained from hand pollination. Pollen mixed with such materials as powdered charcoal, fuller's earth, various kinds of flour, and lycopodium germinated satisfactorily on agar media, but failed, except in the case of lycopodium, to give results in the orchard. It was found that pollen could be collected and applied at about the same cost per tree as that of thinning fruit.

**Further pollination studies with the McIntosh apple in the Champlain Valley of New York,** A. B. Burrell and L. H. MacDaniels (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 374–385; abs. in New York Cornell Sta. Rpt. 1931, p. 88*).—In this detailed report, one series of branches that were hand-pollinated two years in succession showed a higher average set over the two years than check branches that were exposed to natural agencies of pollination. Unit branches which bore a heavy crop in 1929 had a lighter bloom in 1930 but set a large percentage of blossoms when hand-pollinated. Delaying pollination until the petals were from one-half to two-thirds fallen improved the set as compared with those that were not hand-pollinated, but the set was only about one-fourth of that on branches that were open to natural agencies of pollination.

**To what extent is "spray burn" of apple fruit caused by the freezing of the flowers?** L. H. MacDaniels and A. J. Heinicke (*Phytopathology, 20 (1930), No. 11, pp. 903–906, figs. 2; abs. in New York Cornell Sta. Rpt. 1931, p. 88*).—Observations in the New York Cornell Experiment Station orchard during the season of 1928 indicated that a temperature of 24° F. which occurred before petal fall caused much of the russeting, resembling spray injury, that developed on the skin of apples. Histological studies of the lesions thus formed indicated that the original epidermal cells were killed, and that the lesions were covered with a cork layer regenerated from the tissues underneath.

**The Bellmar, Southland, and Redheart strawberries,** G. M. Darrow and G. F. Waldo (*U. S. Dept. Agr. Circ. 171 (1931), pp. 8, pl. 1, figs. 5*).—Three promising new strawberry varieties originated at the U. S. Plant Field Station, Glenn Dale, Md., are discussed as to parentage, adaptation, characteristics, and value.

**Nitrogen fertilization and the pectic materials in grapes,** E. F. Hopkins and J. H. Gourley (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 164–169, figs. 5; abs. in New York Cornell Sta. Rpt. 1931, p. 41*).—No significant effect was found from the use of fertilizers on the following pectic materials, (1) pectin soluble in cold water, (2) pectose or protopectin, and (3) pectic materials in the middle lamella, in the fruit of the Concord grape. With the possible exception of the manured plat, no consistent difference was noted in the several pectic fractions. The highest yield was obtained on the manured plat, but there were no striking differences. Soluble pectin increased from July 14 to final harvest, August 27, with the period of rapid increase occurring from July 30 to August 13. Insoluble pectic materials, on the other hand, decreased during the entire period, suggesting a conversion of insoluble to soluble forms during the ripening period.

**[Forcing the pineapple]** (*New York Cornell Sta. Rpt. 1931, p. 40*).—As reported by A. G. Rodriguez, smoke from smudge fires under a tent of loose cloth forced pineapples to bloom within three weeks after treatment. The exposure of slips and suckers to ethylene gas produced plants which yielded ripe fruits in six months instead of the usual 12 to 14 months.

## FORESTRY

**[Forestry at the New York Cornell Station]** (*New York Cornell Sta. Rpt. 1931, pp. 56, 57*).—An examination of hemlocks left after the cutting of a 45-year-old second-growth stand showed these trees to be entirely free from windshake and rot. Observations on the effect of the 1930 drought on the forest flora showed many herbaceous plants to have been killed as early as August. In young planted forest stands oak and ash survived better than did pine and spruce.

**[Forestry at the Vermont Station]** (*Vermont Sta. Bul. 332 (1931), p. 20*).—The effects of soil temperature on the germination and development of white pine seedlings was studied under controlled laboratory conditions and showed positive differences in top and root growth associated with temperature. Germination of the seed was greatly accelerated in the warmer soils. Differences in root development and wood formation on the opposite sides of the same tree were obtained by growing a portion of the roots in moist and a portion in dry soil.

**The effect of time of taking, medium, and bottom heat on the rooting of evergreen cuttings, H. C. Esper** (*Ohio Sta. Bimo. Bul. 154 (1932), pp. 9–17*).—The results are presented of studies in the propagation of five conifers, *Thuja occidentalis, Juniperus chinensis pfitzeriana, J. sabina, Taxus cuspidata*, and *Chamaecyparis pisifera plumosa*. As concerned time of propagation, larger percentages of rooting were secured with cuttings taken in late fall or early winter. Where no bottom heat was used, cuttings of three of the species rooted best in pure slag or a mixture of peat and slag, and although somewhat different results were obtained with the other two species the author suggests that if one rooting medium is to be used it should be a mixture of peat and slag. The type of medium most satisfactory in November was not necessarily the best later in the season. A bottom heat of from 65 to 70° F. with an overhead temperature of from 50 to 55° is recommended on the basis of results. The *J. sabina* cuttings were, however, an exception, rooting better with low bottom heat.

**Chamaecyparis thyoides in Orange County, New York, W. C. Muenscher** (*Torreya, 31 (1931), No. 1, p. 9; abs. in New York Cornell Sta. Rpt. 1931, p. 42*).—The occurrence of the coast white cedar is recorded in two swamps about 6 miles north of Port Jervis, which extends its known range in New York.

**Farmers in Northern States grow timber as money crop, W. K. Williams** (*U. S. Dept. Agr., Farmers' Bul. 1680 (1931), pp. 11+22, figs. 13*).—Examples are presented of the experiences of farm owners in several Northern States in the management of their woodlands with a view to suggesting helpful measures in the planning of a timber-growing project and to inspiring greater interest in the farm woodlot.

**The killing of trees with sodium arsenite, J. A. Cope and J. N. Spaeth** (*Jour. Forestry, 29 (1931), No. 5, pp. 775–783, fig. 1; abs. in New York Cornell Sta. Rpt. 1931, p. 57*).—Plants such as thorn apple and wild apple, which are practically useless from a silvicultural standpoint and destructive to pasture land, were effectively and economically destroyed by introducing sodium arsenite solution into cuts made near the root crown. Autumn, August to December, was the most effective season for treatment, and the poisoning of standing trees was more effective in killing the root system than was the treating of stumps of recently cut trees. A tool which makes the cut and introduces the poison at one operation is described.

## DISEASES OF PLANTS

**[Plant pathology studies at the Colorado Station]** (*Colorado Sta. Rpt. 1931, pp. 19, 20, 23, 25, 26*).—Studies, by W. G. Sackett, of the comparative resistance of several varieties of alfalfa to bacterial wilt showed the Canadian Variegated, Cossack, and Grimm varieties to be promising. The disease became a serious factor when alfalfa stands reached their third year.

Aging of bean seed failed to show any value as a means of controlling bacterial blight, plants from 2- and 3-year-old seed succumbing as readily as those from fresh seed. Supposedly resistant varieties obtained from the U. S. Department of Agriculture suffered as badly as commercial varieties.

In a survey of diseases affecting greenhouse crops, by E. J. Starkey, 52 distinct troubles were found in the Denver region. Carnation root rot was found to be transmitted by cuttings taken from diseased plants, and stem rot of the carnation (*Rhizoctonia* sp.) was spread by careless watering. Ammoniacal copper carbonate spray proved desirable on delicate flowers and foliage, and copper carbonate dust was found more satisfactory than sulfur for the control of mildew on sweet peas under glass. All varieties of chrysanthemum tested except Sidawitz were immune to blackleg (*Cylindrosporium*). An excess of nitrates in the absence of sufficient phosphorus was found causing serious trouble in cucumbers.

**[Plant pathology at the Georgia Coastal Plain Station]** (*Georgia Coastal Plain Sta. Bul. 16 (1931), pp. 58, 59, 80–82*).—Inconclusive results were secured in spraying experiments with cantaloupes because of the severe drought. Bordeaux mixture gave the best disease control but injured the leaves. Sulfur proved very harmful to the vines and of little value in disease control. Copper acetate spray led in yields, but the gains were not significant.

Tobacco root knot caused severe losses in 1930, leading to the recommendation that seed beds be located on new soil each year. Field control was obtained by rotating tobacco with two successive years of nematode resistant crops such as peanuts, corn, velvet beans, and brabham peas. Tobacco following peanuts was slightly inferior in quality to that following resistant weeds such as crabgrass, Florida pursley, and beggarweed. Tobacco following velvet beans and brabham peas was distinctly inferior. Plowing up infested tobacco stalks and roots and thus exposing them to complete drying materially reduced the nematode population. Of 91 tobaccos tested for root knot resistance, none displayed any marked resistance.

**[Plant pathology at the New York Cornell Station]** (*New York Cornell Sta. Rpt. 1931, pp. 65–72, 74, 75, 77, 78*).—Spraying by controlling late blight increased the yield of potatoes on Long Island by 86.8 bu. per acre, and by checking leafhoppers and flea beetles increased yields 88.4 bu. at Pittsford and 41.7 bu. as averaged for several localities in western New York. Four hundred lbs. pressure proved more profitable than 200 lbs., and further increases in yield were obtained at 600 lbs., but only with greater quantities of material. The optimum quantity was about 115 gals. of 5–5–50 Bordeaux mixture per acre. Increasing the concentration of the Bordeaux mixture gave no significant increase in yield in the case of Green Mountain potatoes on Long Island and actually decreased yields of Russet Rural at Pittsford, apparently by increasing top growth at the expense of tuber formation. On Long Island soda Bordeaux proved definitely inferior to lime Bordeaux. A comparison of different kinds of lime for making Bordeaux mixture did not yield consistent results. At Pittsford careful dusting gave good results, but in cooperative tests dusts proved inferior to sprays. Injury caused by the wheels of spray rigs cut yields 11 bu. per acre.

Observations in Wyoming County indicated that pitting of potatoes is due to a combination of wireworm and Rhizoctonia injury, but that either alone could not cause typical pitting. Seed treatment with hot corrosive sublimate, calomel, and yellow oxide of mercury reduced the stem lesions caused by Rhizoctonia, but gave only slightly increased yields. The yellow oxide retarded early growth.

Roguing of virus-infected potatoes was not an adequate control measure, but tuber indexing gave excellent results. An average of 30 per cent of infection was found in indexed Smooth Rural seed from certified sources. A positive correlation was noted between the average number of aphids per plant and virus increases.

A total of 44 bean varieties were tested for susceptibility to halo blight, the most destructive bacterial disease found in beans. Studies of three strains of bean anthracnose, *Colletotrichum lindemuthianum*, showed all three, namely, alpha, beta, and gamma, to possess the ability to ferment dextrose, levulose, galactose, arabinose, xylose, lactose, maltose, sucrose, dulcitol, glycerol, mannitol, salicin, and cellulose, but not starch. Nitrates were reduced, and hydrogen sulfide was not produced.

Celery blight (*Cercospora apii*) was effectively controlled by spraying the young seedlings two to three times, with later spraying in the field. Treatment of the seedlings often saved from 20 to 105 crates of celery per acre at harvest time. The dandelion was added to the list of plants, namely, plantain, wild carrot, certain asters, and milkweed, that may harbor lettuce yellows. Inoculation tests with two strains of bacteria isolated from black-joint lesions of celery infection led to the suggestion that the discoloration is due to saliva injected by the tarnished plant bug rather than to bacteria. A mercurial compound was discovered which was as effective as calomel in the control of bottom rot of lettuce and much less harmful. Plowing under cover crops of oats or sweetclover reduced the amount of bottom rot in many cases. The finding of mycelium of onion mildew (*Peronospora destructor*) in the ovules of the seed showed the disease to be seed borne. *Allium schoenoprasum* was found to be a host plant of the mildew. Among lettuce tested for resistance to downy mildew, strains of Iceberg from California proved resistant. The Phoma and Sclerotinia root rots of celery were found to have low optimum and very low minimum temperature requirements for growth. *Phoma apii* attacked celery seedlings over a wide range of soil moisture and soil temperature conditions, but comparatively low temperatures were most favorable for infection. Excellent control of carrot blight (*Macrosporium carotae*) was secured by the use of copper dusts and sprays. Weeds were found an important factor in harboring this fungus. Attempts to control spinach mildew with sulfur and copper fungicides were unsuccessful.

Water shortage in early summer is believed to be an important factor in the development of drought spot of apples in the Champlain Valley. Post rain applications of fungicides gave good control of apple scab.

Powdery mildew caused a definite stunting and increased transpiration in barley plants. The increased transpiration was found due to an increased stomatal opening and to transpiration through the fungus mycelium. Perithecia were produced only on old leaves. Sulfur dust was found highly effective in the control of black spot of roses. The Botrytis blight of lilies was controlled by the use of Bordeaux mixture and copper lime dust. Dusting of lily bulbs with mercury compounds controlled storage and transit rots.

Chestnut blight (*Endothia parasitica*) grew well in water extracts of 9 of 11 chestnut species. Growth on an extract of wild black cherry was checked for from 6 to 14 days, after which normal growth occurred. It is believed that the hydrocyanic acid in cherry bark was the limiting factor. The fungus grew slowly in maple bark extract.

**[Plant pathology at the South Carolina Station]** (*South Carolina Sta. Rpt. 1931, pp. 47–52, 54, 55, figs. 2*).—The concentration of soluble arsenic as measured by collodion bag dialyzates was found by W. B. Albert and C. H. Arndt to be a more reliable index of arsenic toxicity than is the total arsenic present in the soil. Liming and the use of fertilizer along with the iron and clay compounds of the soil played an important rôle in rendering arsenates harmless to sensitive crops. The addition of 1 part per million of arsenic definitely retarded root and top growth of cowpeas growing in the greenhouse. It is pointed out that the concentration of 1 part per million of soluble arsenic, as measured by the collodion bag test, is not unusual in heavily arsenated fields. A concentration of M/40,000 potassium arsenate in a basal nutrient solution was sufficient to reduce greatly the growth of cotton plants growing in water cultures. Potassium arsenite was approximately four times as toxic as potassium arsenate. In some cases concentrations of arsenicals sufficient to greatly reduce top growth stimulated root elongation.

Experiments conducted by Arndt and G. M. Armstrong indicated the value of early planting of cotton despite lower percentage germination. To measure the effect of temperature on germination and seedling development, cotton was planted in tanks where constant soil temperatures of 18 and 25° C. could be maintained. Most of the seedlings at 18° showed typical damping-off symptoms, but the lesions were not like those caused by damping-off fungi. Fungi, frequently associated with the lesions, were apparently not primary. Nematodes were invariably present. Similar lesions appeared on cotton at 25°, but were not often destructive because of the more rapid growth of the plant.

Observations on 52 cotton varieties planted early and late in the field showed from 80 to 90 per cent of the seedlings of the early crop to be killed as compared with 20 to 40 per cent for the late crop. Of the dead plants, nematodes had killed from 70 to 80 per cent, Corticium from 8 to 15 per cent, and *Fusarium* spp. from 5 to 10 per cent. The nematode was identified by G. Steiner as *Aphelenchus parietinus*. Delayed planting until about the second week of May at Clemson is suggested as a practical nematode control. Some indication was seen that certain varieties or strains of cotton can thrive better than others under low temperature.

Arndt observed in the greenhouse studies that with a temperature range of from 18 to 20° C., the arsenic content of the soil is a factor in reducing germination of cotton and had no effect on nematode control. High moisture content in the soil decreased germination and increased nematode injury in both the arsenic and nonarsenic soils. Where the temperature range was from 25 to 30° C., germination was similar in both arsenic and nonarsenic soils, but the plants in the arsenic-containing soil did not recover as readily from nematode injury. In the arsenic-containing soil which was steamed or treated with toluol, cotton plants made very good growth.

After delinting with sulfuric acid, certain varieties of cotton were germinated under sterile conditions to determine whether internal pathogenes might be present. The maximum percentage of infection recorded was 24 per cent, and the organisms found included *Bacillus malvacearum*, *Fusarium moniliforme*, *F. semitectum*, *F. reticulatum*, *Alternaria* spp., etc. The results indicated that internal infections may play an important rôle in the dispersal of some of the common diseases of cotton as well as reducing germination.

The results of a general plant disease and a special tobacco disease survey are briefly discussed.

**Studies on the fire-blight organism, Bacillus amylovorus,** A. L. PIERSTORFF (*New York Cornell Sta. Mem. 136 (1931), pp. 53, pls. 3*).—Ready infection of *Crataegus oxyacantha* and *Photinia villosa* was secured upon inoculation with fire blight. Strawberries, roses, and Japanese quince were infected but not readily, and several other species of the rose family were added to the list of suscepts.

It was found that the blight organism can live in a medium of pH 4.6, can withstand a temperature of —183° C. for 10 minutes, and that heating to 48° for 10 minutes does not always inhibit growth. Positive evidence was secured that fire blight forms the enzymes sucrase (or invertase), maltase, inulase, and arbutase. A toxic principle found in the sap of blighted green pear fruits had many of the characteristics of a true bacterial toxin such as found in animal pathogenes.

The viability of the bacillus was shown in the fact that living bacteria were isolated from limbs held for two years in the laboratory. Viable bacteria were isolated from hold-over cankers on twigs only 0.25 in. in diameter.

The bacteria entered flowers most commonly through the nectariferous surfaces, occasionally through the petals and the styles. Naturally inoculated pear leaves were found on trees infested with leafhoppers, and atomizing young thrifty pear and apple tissues failed to cause infection in the absence of insects. Rain water did not appear to spread bacteria from bloom to bloom, and as blooms aged their susceptibility decreased. The process of pollination had little if any influence on susceptibility.

**Morphologic and physiologic studies on stem-rust resistance in cereals,** H. HART (*U. S. Dept. Agr., Tech. Bul. 266 (1931), pp. 76, figs. 29*).—Cooperative studies between the Minnesota Experiment Station and the U. S. Department of Agriculture upon the nature of resistance of gramineous hosts to *Puccinia graminis* indicated that resistance does not depend on any single factor, but may be due to protoplasmic, morphologic, or functional peculiarities of the host. Certain varieties of wheat, such as Hope, possessed to some degree at least all three general types of resistance while others were resistant in only one or two respects.

All the aboveground portions of a wheat plant contain rust susceptible tissues, but the quantity and distribution vary in different parts of the plant and at different stages of development. For example, in the wheat seedling practically all the tissue was susceptible, while in the mature plant, although a large proportion of the leaf blade was susceptible, there were in the peduncle and rachis smaller amounts of susceptible tissues distributed subepidermally in longitudinal strands. The anatomical features concerned in susceptibility and resistance of the different tissues are discussed in detail.

Not all tissues in which the rust can grow were equally susceptible, as the thickness of the cell walls and the degree of compactness influence the rate of entrance. In certain varieties slow opening of the stomata in the morning makes for resistance to all physiological forms of rust because the germ tubes dry up before they could enter the plant.

No one fertilizer or combination of fertilizers had any consistent or sufficient effect on the structure of the plant to affect its susceptibility or resistance to rust. The fact that stem rust often develops almost exclusively on the north side of plants was not found associated with difference in structure nor to difference in total sugars or reducing sugars. Wheat plants affected with other diseases or with their heads clipped were more susceptible to heavy infections to rust than were healthy plants.

**Seed disinfection.—III, Cereals and graminaceous seeds** [trans. title], E. Gram (*Tidsskr. Planteavl, 35 (1929), No. 2, pp. 141–268; Eng. abs., pp. 266–268*).—The present report of experimentation, following up the studies previously noted (E. S. R., 58, p. 144), covers experiments dealing mostly with new disinfectants or methods of disinfection for graminaceous seed, including wheat bunt (*Tilletia caries*), smooth-spored smut (*T. foetens*), loose smut (*Urocystis tritici*), and *Fusarium minimum*; rye stem smut (*U. occulta*); barley head smut (*Ustilago hordei*), loose smut (*U. nuda*), stripe (*Pleospora graminea*), and net blotch (*P. teres*); oat loose smut (*U. avenae*), hard smut (*U. kolleri*), seed injury (*U. bromivora* and *U. perennans*), seedling mold and snow mold (*F. minimum*), and foot rot, occasionally developing into stem rot and ear scab (*F. culmorum*, *F. avenaceum*, et al.).

Recommendations include steeping (for which formulas are given) for wheat bunt; sprinkling, with reshoveling, and covering with moistened bags for from 6 to 8 hours after applying formaldehyde, though drying at once is necessary after Fusariol; semidry disinfection employing a mixing drum and covering as in sprinkling; or dusting with final sprinkling in a dust-proof drum.

**Plant diseases and pests in Denmark, 1928** [trans. title], (*Tidsskr. Planteavl, 35 (1929), No. 3, pp. 420–471, figs. 11; Eng. abs., pp. 470, 471*).—Climatic conditions and outbreaks are indicated, with accounts separately of oat and other cereal white tip disease; oat dry speck, also attacking beets, mangolds, and potatoes, and similar diseases in strawberries, roses, and leeks, besides chlorine poisoning in connection with weed control; a swede dry rot (*Phoma napobrassicae*), raspberry anthracnose (*Plectodiscella veneta*), *Puccinia mirabilissima* in several localities; oat nematode attacks (*Heterodera schachtii*), and barley root deformation (*Tylenchus pratensis*), attacking also grasses; and potato nematode attack (*H. rostochiensis*).

Diseases and pests named as new to the country include a begonia disease (bacteriosis?), mangold outgrowth (*Bacterium beticola?*), pansy leaf spot (*Cercospora* sp.), *Abies concolor* twig canker (*Fusarium* sp.), Azalea stem rot (*Ramularia* sp.?), barley root nematode (*T. pratensis*), reversion in red currants and *Ribes sanguinea*, leaf curl in mangolds and sugar beets, and a tulip bulb abnormality (ascribed to heating in transit).

For potato late blight control, dusting with Cupryl or with Niagara Bordeaux dust approached Bordeaux spray in effectiveness. To avoid spraying injury in apple growing, lime-sulfur for preblossom and weak excess-lime Bordeaux for calyx spray are recommended.

Though root nematodes (*H. radicicola*) are partly controlled by watering with 4 per cent of ammonia or calcium cyanamid (at from 90 to 105 gm. per square meter), the treatment was readily survived by the nematodes inside the old nodules. Details are given regarding actions and agents directed against animal pests in various forms, stages, and relations.

**On the snow-rot (Yukigusare) fungus, Typhula graminum, Karsten, of graminaceous plants** [trans. title], H. Tasugi (*Jour. Imp. Agr. Expt. Sta., Nishigahara, Tokyo, Japan, 1 (1929), No. 1, pp. 41–56, pls. 2; Eng. abs., pp. 55, 56*).—The account given of *T. graminum*, the cause of snow rot ("Yukigusare") of winter wheat, barley, and other graminaceous plants, sets forth that the fungus attacks the plant severely under snow, injuring leaves, stems, and roots, killing it as a whole or in part, perhaps allowing young buds to survive. In the warm weather of spring, the fungus is inactivated and the surviving grain plant continues to grow. The sclerotium left on the field remains dormant during summer, but in autumn it gives rise to fruit bodies bearing basidiospores which germinate in soil or on seed plants, the germ tubes invading the plant tissue. The fungus is most active at temperatures around 0 to 10° C., ceasing to grow at 25°.

It is thought that the two names *T. graminum* and *T. elegantula* have been applied to the same form, which, the author holds, should be referred to as *T. graminum*, according to priority. A complete description is given of the sclerotium also of the fruiting body of this fungus.

**Oat-sick land in relation to eelworm disease,** D. ROBERTSON (*Scot. Jour. Agr., 12 (1929), No. 1, pp. 40–45*).—It is claimed that the deficiency in the growth of oats on oat-sick soil is due to adverse soil conditions and improper nutrition, supposedly resulting from manuring the soil with cockle shells and fish refuse.

The view is held erroneous that nematodes (*Anguillulina dipsaci*) are prevalent and causal in oat-sick soils. Oats develop normally and profitably on oat-sick land if nitrogen in the form fixed by the soil (ammonium sulfate) is applied at seeding time.

**Frost-tolerant and blight-resistant potatoes,** D. REDDICK (*Phytopathology, 20 (1930), No. 12, pp. 987–991; abs. in New York Cornell Sta. Rpt. 1931, p. 42*).—*Solanum demissum* and *S. commersonii* from Montevideo were subjected on two successive nights to 29° F., apparently without injury. First generation hybrids of each of these species showed a similar frost tolerance. *S. commersonii* from three other sources, with numerous varieties of *S. tuberosum*, were killed. *S. demissum* is immune from *Phytophthora infestans* as are also some first generation hybrids.

**On the variation of rice varieties in the resistance to the toxic action of potassium chlorate, and its practical significance** [trans. title], M. YAMASAKI (*Jour. Imp. Agr. Expt. Sta., Nishigahara, Tokyo, Japan, 1 (1929), No. 1, pp. 1–24, pls. 2; Eng. abs., pp. 23, 24*).—In experiments conducted with a view to ascertaining resistances of rice varieties to potassium chlorate, applied as a weed killer, it was found that upland rice is in general more resistant than lowland rice. Particularly among the upland varieties resistance to the toxicant is closely related to drought resistance. In both cases the later maturing varieties show more resistance than the earlier maturing ones.

Seedlings grown in the irrigated nursery and those grown in shade are more resistant, respectively, than those grown under upland conditions and those exposed to sunshine. Resistance to the toxicant becomes weaker at advanced growth stages.

Upland rice varieties were also contrasted with those of lowland rice in experimentation in which the expressed cell sap concentration of seedlings was examined as to freezing points. In seedlings from the irrigated nursery the cell saps of the upland varieties showed the lower concentrations, but the reverse was the case with seedlings from the upland nursery.

In cultures of seedlings in a 0.1 per cent $KClO_3$ solution, much more water was absorbed during 17 hours by the upland than by the lowland varieties. It is claimed that the quantity of the toxicant absorbed by the seedlings in a given time is much less in the upland than in the lowland rice.

From the data obtained, it is thought likely that the difference in the resistance between upland and lowland rice to the toxic solution may be attributed to the varietal difference in the permeability of root cells to the toxicant but not in the osmotic pressure of cell saps.

**A new bacterial leaf disease of tobacco in the Philippines,** F. M. CLARA (*Phytopathology, 20 (1930), No. 9, pp. 691–706, figs. 3; abs. in New York Cornell Sta. Rpt. 1931, p. 78*).—A new bacterial leaf disease of tobacco, characterized by white or opaque spots, was observed in the Philippines in 1925. The disease appeared first in the seed beds and later in the fields of the Ilagan Tobacco Experiment Station. Considerable damage occurred on young seedlings and on plantings in the field. During the year 1925–26 from 50 to 90 per cent infection was noted. The nature of the damage ranged from the production of spots to a total rotting of seedlings similar to damping-off. Infected matured leaves are rendered unsuitable for wrappers of high-grade cigars. The causal organism was named *Phytomonas polycolor* n. sp. A full detailed description is given. Its chief differences from *P. mellea* and certain similarities to other bacterial plant pathogenes are discussed. Attempts at control measures by seed disinfection with silver nitrate (1 in 1,000 for 10 to 15 minutes) showed encouraging results.

**Disease in strawberries,** D. G. O'Brien and E. J. M'Naughton (*Scot. Jour. Agr., 11 (1928), No. 3, pp. 286–297, figs. 6*).—Within recent years, in parts of Great Britain and especially in the Clyde Valley, the Lanarkshire strawberry disease has constituted a menace to the strawberry industry. An outline is given of the related literature, of the disease, its bearings, and its control.

A paucity of absorbing rootlets and consequent starvation constitute leading characteristics. The only organism constantly found present is an endotrophic mycorrhizal fungus of the type bearing arbuscules and vesicules. This organism invades chiefly the fine absorbing roots, doing its greatest injury at or about flowering time. Starch and other materials are removed from the root tissues.

This fungus is regarded as parasitic and fundamental to this disease, which tends to be slow-acting and chronic, but which appears to be potentially fatal in cases of severe infection.

Unfavorable conditions may aggravate the attack. Secondary fungi and bacteria may aggravate the disease. The broken-off root fragments infect the soil, which may in turn infect the healthy runners. It is apparent that the fungus is not specific to the strawberry, but that it may invade grasses and clovers intermediately.

**Crown rot of Juglans in California,** C. O. Smith and J. T. Barrett (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 10, pp. 885–904, figs. 9*).—Observing the species *J. californica* and *J. hindsii*, commonly used in California as rootstocks for the Persian walnut, to be susceptible to attack by a fungus that sometimes kills mature trees, the California Experiment Station studied the disease and found the causal organism to be a species of Phytophthora, provisionally designated as *P. cactorum*.

Artificial inoculation caused lesions on *J. californica*, *J. hindsii*, *J. nigra*, *J. mandshurica*, *J. regia*, *J. sieboldiana*, *J. major*, *J. pyriformis*, *J. insularis*, and the Paradox hybrid *J. californica* × *J. regia*. The aerial lesions caused by artificial inoculation usually became inactive with the advent of hot weather, and many never again increased in size. Lesions developing in old southern California black walnut were the largest, often girdling trunks up to 8 in. in diameter for a distance of from 6 to 8 ft. Lesions in the northern California black walnut were considerably smaller and were never large in the Persian walnut.

As control, the authors suggest that resistant stock, probably some variety of the Persian walnut, be used in new plantings. The proper use of irrigation water and the control of flood water are suggested as precautionary measures in old orchards, and the exposure of the diseased crown to the air was found effective in checking spread. Surgery is recommended only as a final resort.

**Two blue-staining fungi associated with bark-beetle infestation of pines,** C. T. Rumbold (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 10, pp. 847–873, figs. 8*).—In a study conducted by the U. S. Department of Agriculture to determine the fungi associated with bark beetle damage, two apparently important forms were found.

The first organism, known as *Ceratostomella pini*, was found growing from the galleries of the bark-boring beetle *Dendroctonus frontalis* in eastern pines and from the galleries of *D. brevicornis* in California and Idaho pines. This fungus is said to be easily recognized when growing beneath the bark of beetle-infested trees by its black sclerotia and perithecia which caused the phloem to appear as if coated with coal dust. The color of the stained wood is gray, shading from light neutral to dark neutral, with the rays and resin ducts appearing black.

The second organism, designated as *Ceratostomella ips*, and heretofore undescribed, was found in eastern pines infested with *Ips calligraphus* and *I. grandicollis*. The stain caused by *C. ips* is a slate gray shading to a slate black, and the rays and resin ducts appear black. Freshly stained moist sapwood has a steel blue cast. The perithecia are large and appear black to the naked eye.

**A peculiar pine forest injury** [trans. title], O. LANGLET (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 5, pp. 261–265, figs. 2*).—During the spring and summer of 1928 there occurred in the forests of northern Sweden a peculiar form of injury to the foliage of pines, localized chiefly in the upper part of the tree. This occurrence is described as found in certain valley areas where the upper warm air drifting over the cold layers in the valleys subjects chiefly the upper parts of the trees to differing and changing temperatures.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Usefulness of birds on the farm,** W. L. MCATEE (*U. S. Dept. Agr., Farmers' Bul. 1682 (1931), pp. II+14, figs. 7*).—This practical account deals with the combined attacks of birds on pests, their daily warfare on insects, the bird population, and the public attitude toward birds.

**Studies on fish,** C. M. MCCAY and M. F. CROWELL (*New York Cornell Sta. Rpt. 1931, p. 32*).—Studies in cooperation with the Connecticut State Hatchery to develop a practical ration for rearing brook trout in hatcheries has shown the contrast between the food requirements of fish and of the higher mammals. Trout are readily poisoned by linseed meal, utilize soybeans poorly, use moderate amounts of coconut meal fairly well, and thrive on high intakes of cottonseed meal. All these products must be fed with raw meat. Both dry skim milk and dry buttermilk have been found to be effective trout feeds when combined with raw meat.

In attempts to find better methods for the control of fish diseases, preliminary studies with ultra-violet light radiation showed that trout can be killed by sufficient radiation even if they are protected by several inches of flowing water. If the period of radiation is shortened, however, the external parasites of the fish can be destroyed without injury to the host.

A comparative study of the blood composition of fish, turtles, and lamprey eels has shown that fish blood has about four times as much phosphorus per unit volume as has the blood of the higher vertebrates such as cows. Turtle blood contrasts with fish blood in its low content of phosphorus compounds in the plasma. Both the cholesterol and the phospholipids of turtle blood are low, while those of fish blood are very high.

**Common names of insects approved for general use by the American Association of Economic Entomologists** (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1273–1310*).—A list of the common names of economic insects thus far approved by the association, 879 in number, is followed by a list of the scientific names, both being alphabetically arranged.

**[Notes on economic insects]** (*Jour. Econ Ent., 24 (1931), No. 6, p. 1311*).—The contributions here presented (E. S. R., 66, p. 447) are as follows: Altitude Records for *Diabrotica duodecimpunctata* (Fabricius) in Tennessee, by W. W. Stanley; Twelve-Spotted Asparagus Beetle [*Crioceris duodecimpunctata* L.] in Iowa, by H. M. Harris; and The Method of Ingress of Newly Hatched Larvae of the Throat Bot of Horses (*Gastrophilus nasalis* L.), by R. W. Wells.

**[Report of work in entomology]** (*New York Cornell Sta. Rpt. 1931 pp. 45–54*).—In control work on granulation in honey a study was made by E. J. Dyce of the temperature and other conditions conducive to the most rapid formation of dextrose crystals. It was found to be practicable to destroy the sugar-tolerant yeasts which occur in most honeys and which sometimes cause fermentation by heating the honey to 160° F. "If this temperature is maintained for a short time only and the honey is then cooled as rapidly as possible, the product is in no way injured. When the honey has reached a temperature of about 75°, there is added about 5 per cent of honey which has previously been processed and in which the crystals are minute. The honey is then placed in storage in the final container at a temperature between 56 and 58°, and at the end of about two days of storage it will have become granulated to a degree which would usually be designated as 'solid.' With honeys of high viscosity slightly higher temperatures cause more rapid granulation for the period when the honey is stored, about 60° being desirable, but for most honeys a constant temperature of 57° gives excellent results. Honey put through this process carries a flavor superior to that of the same honey in either liquid or coarsely granulated form and approximating the flavor of the same honey in the form of comb honey. The facts that later fermentation has been precluded and that the flavor is rendered superior would appear to make this method one of advantage to the honey market." Application is said to have been filed for a patent on the process and the product in the name of Cornell University.

A study of the value of wild insects as pollinators of fruit trees was made by E. F. Phillips, assisted by a group of collectors in the fruit region of western New York for the period of apple blossoming in 1931. Evidence was found in all seven of the orchards of a shortage of pollination insects as compared with conditions commonly found in apple trees in bloom. Bumblebees were caught at lower temperatures, and honeybees worked for longer hours, than any other species. The syrphid flies appeared to be of more value in some orchards than did any other kind of insects. The conditions under which solitary bees work on apple blossoms seemed to be strikingly limited. The extent that the limitation of the number of wild insects at work on apple blossoms is to be attributed to congestion of orchards remains to be determined. One orchard in which collections were made was found to be virtually a desert so far as the presence of insects on the blossoms was concerned.

Reference is made to experiments by G. W. Herrick and G. H. Griswold with the webbing clothes moth, in which it was found that paradichlorobenzene will kill the eggs, larvae, and pupae, as previously noted (E. S. R., 65, p. 457). It is pointed out that in more recent experiments a mixture composed of 3 parts of ethylene dichloride and 1 part of carbon tetrachloride proved very effective against both eggs and larvae even at temperatures as low as from 60 to 65°, the action being found much more rapid than that of paradichlorobenzene. Experiments begun in April, 1930, and continued through March, 1931, proved that clothes moth females will lay eggs during every one of the twelve months of the year.

It was found in experiments that the gas of ethylene oxide, recommended by Back, Cotton, and Ellington (E. S. R., 63, p. 458) as a fumigant, will kill bean weevils and flour beetles at temperatures near 85° with concentrations of about 16 oz. of gas to 1,000 cu. ft. of space and with exposures of 12 to 24 hours.

In work by G. F. MacLeod it was determined that the characteristic pitting of potatoes apparently is due primarily to wireworms and that the Rhizoctonia organisms increase the damage. A study made of various chemicals has shown that 3 per cent of calomel in soils will kill wireworms, although 5 per cent of lead arsenate apparently does not affect them. Potato seed pieces treated with either a dust or a spray of calomel were not injured by wireworms.

Preliminary laboratory studies indicate that millipedes will not feed on normal, healthy potato tubers under average seasonal conditions, their injuries being most intimately associated with potato scab organisms. Snail injury to potato tubers is confined largely to moist areas in fields and becomes serious only where potatoes are planted on land previously in sod. In work aimed at the protection of potatoes grown on muck soils, four applications of 4–4–50 Bordeaux mixture in a field of Irish Cobblers resulted in an increased yield amounting to more than 100 bu. per acre above the yield where three applications of Bordeaux mixture were made.

In combating the carrot rust fly the most satisfactory method of preventing its injury is indicated by the fact that carrots planted early in June and harvested by September 1 escaped serious injury. Satisfactory protection from maggot injury was obtained with four applications of calomel, 1 lb. to 40 gal. of water, poured about the base of the plants. Six applications of naphthalene at the rate of 1,000 lbs. per acre gave efficient control, but the cost of this procedure was beyond practical limits.

Work was conducted with the tarnished plant bug, which punctures the leafstalk of celery at the nodes, causing dark feeding points indicative of bacterial infection. The leaves turn yellow and drop off in severe cases of injury. Celery attacked by these insects can not be stored and is of little or no value to the grower. It is thought that this aggravated injury is due to an enzyme or an organism which the insect alone is capable of transmitting. Studies of the life history indicated that weeds are the principal food plants of the tarnished plant bug. Sprays of nicotine at three times the usual strength paralyzed the adult bugs temporarily, but more than 80 per cent recovered eventually. Pyrethrum sprays were much more toxic, killing from 95 to 100 per cent of the insects that were actually covered with the spray. Hydrated lime and slate dust, a new material, afforded efficient protection at an average cost of less than $10 per acre.

In studies of the onion thrips more than 19 wild host plants were determined in Orange County. In addition, it has been found feeding on lettuce, cabbage, carrots, alfalfa, clover, cucumbers, cauliflower, turnips, and beans. A study of its parasitic and predacious enemies disclosed the presence of a number of red mites, a flower bug, and another member of the thrips family as destroyers.

**Crickets and grasshoppers in Utah,** W. W. Henderson (*Utah Sta. Circ. 96* (*1931*), *pp. 38, figs. 20*).—This account includes a historical account of the Mormon cricket in Utah (pp. 7–15), a brief history of grasshoppers in the State (pp. 15–20), a description of the morphology of the grasshopper (pp. 20–22), and an account of some pioneer species (pp. 22–36) and of methods of control (pp. 36–38). The more important species of crickets and grasshoppers described, all but two of which are illustrated, include the two-striped Mermiria, *M. bivittata* (Serv.); Elliott locust, *Aulocara elliotti* (Thom.); *Chorthippus curtipennis* (Harr.): clear-winged grasshopper; Haldeman's locust, *Hippiscus corallipes* (Hald.); *Dissosteira spurcata* (Sauss.); Shoshone grasshopper, *Schistocerca* *shoshone* (Thom.); Atlantic locust, *Melanoplus atlanis* (Riley); red-legged grasshopper; Packard locust, *M. packardii* (Scud.); two-striped grasshopper; western meadow grasshopper, *Conocephalus vicinus* Morse; Mormon cricket; sand cricket, *Stenopelmatus fasciatus* (Thom.); cave or camel cricket; and snowy tree cricket.

**The life history of the California red scale (Chrysomphalus aurantii Maskell).—Progress report,** C. I. Bliss, B. M. Broadbent, and S. A. Watson (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1222–1229, figs. 3*).—Daily observations on field-collected adults of the California red scale on green lemon fruits indicated an average productivity of from 85 to 90 crawlers per female. When plotted against mean temperatures, the duration of the first instar was the least dependent upon temperature, the length of the third stage the most. Natural mortality following settling was greater in the last than in the first two instars, and during the winter approached 100 per cent.

**The more important species of leafhoppers affecting the apple,** D. M. DeLong (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1214–1222, figs. 3*).—The author has found that at least 12 species of leafhoppers may become important pests of apple in one or more areas in the United States, the largest number occurring in the Ohio and central Mississippi Valleys. The biology and overwintering stage is said to vary with the species, some passing the winter as adults in hibernation and some as eggs in the plant tissue. A list is given of the suggested common names.

**The soybean caterpillar in Louisiana,** W. E. Hinds and B. A. Osterberger (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1168–1173*).—This contribution from the Louisiana Experiment Stations reports upon the velvetbean caterpillar, first reported as a pest on velvetbeans in Florida in 1903 (E. S. R., 17, p. 782), and which occurred in great abundance on soybeans in Louisiana in 1929 (E. S. R., 64, p. 54) and in less abundance in 1930. Brief notes are given regarding the damage done to soybeans and also regarding some points in the life history at Baton Rouge, La. Insecticidal control is recommended only where necessary to allow the maturity of a desired seed crop, but has been found practically possible by dusting with sodium or barium fluosilicates. Natural enemies include numerous species of birds, insect predators and parasites, and a fungus disease (*Spicaria prasina*). The occurrence of this leaf-eating caterpillar should not be considered a serious obstacle to the further increase of soybean planting in the South.

**Field tests in Texas of insecticides for control of the cotton bollworm (Heliothis obsoleta Fab.),** R. W. Moreland and F. F. Bibby (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1173–1181*).—This is a report of three seasons' field experiments in control operations against the bollworm, conducted by the Texas Experiment Station and the U. S. D. A. Bureau of Entomology cooperating, which have shown profitable results from dusting with arsenicals.

**The well-marked fruit-worm, Stenoma algidella Walk.,** S. W. Frost (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1208–1213, pl. 1, figs. 2*).—This contribution from the Pennsylvania Experiment Station records *S. algidella* for the first time as a major pest of apple, it feeding on both fruit and foliage. Brief notes are given on its life history and habits. There appears to be one complete brood each year, the winter being passed in the pupal stage.

**Some field observations on codling moth behavior,** A. D. Borden (*Jour Econ. Ent., 24 (1931), No. 6, pp. 1137–1145, fig. 1; also California Sta., Calif Com. Relat. Elect. Agr., Prog. Rpt. 16 (1931), pp. 1137–1145, fig. 1*).—This contribution from the California Experiment Station reports upon observations in 1928 and 1929, particularly of the effect of artificial light on the egg-laying habits of the codling moth, manner of flight, and attraction to bait traps (E. S. R., 65, p. 752). A block of 15 apple trees in an orchard near Sebastopol, Calif., was flooded each evening during the sunset period for about 3 hours from April 26 to June 30, 1928, and from April 25 to October 24, 1929, six 500-watt lights being used in 1928 and eighteen 500-watt lights during 1929. A table is given which records the observed sunset time, codling moth flight, weather conditions, and bait trap catches from April 24 to October 24, 1929, at Sebastopol.

It appears that the flight is governed by temperature, humidity, light intensity, and air movements. A study of the bait traps has shown that very seldom are the moths caught except during the sunset period, and that there is a decided increase in the moth taken at this period whenever the temperature is over 60° F. Only twice in the season was observed what might have been a sunrise flight.

**Four years experiments with chemically treated codling moth bands,** L. F. Steiner and G. E. Marshall (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1146–1151*).—It is concluded from work at the Indiana Experiment Station (E. S. R., 62, p. 248) that β-naphthol-oil and α-naphthylamine-oil-paraffin impregnated corrugated paper bands can be used successfully as a supplementary control for the codling moth in Indiana. The α-naphthylamine combination, developed during four years' experiments with numerous chemical treatments, appears under conditions in the State to be superior to the β-naphthol combination in effectiveness and in attractiveness to codling moth larvae. Both materials almost entirely prevent adult emergence, which has never exceeded 2 per cent of the larvae captured. After use on the same mature trees for three successive years neither chemical has produced any injury.

**Hibernation of Pectinophora gossypiella in Texas,** F. A. Fenton and W. L Owen, jr. (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1197–1207, pl. 1*).—The authors report upon three years' studies on the hibernation of the pink bollworm, conducted by the Texas Experiment Station and the U. S. D. A. Bureau of Entomology cooperating.

"It was found that in the cotton field the greatest number of the overwintering stages were in bolls on the stalks, although a considerable number were in shed forms or cocoons in trash on the surface of the ground. A comparatively small percentage were in the soil. Averages for three years show that the final survival in bolls buried 4 in. but not irrigated was greater than in bolls on the surface of the soil when not irrigated, though this ratio was reversed in sandy-loam soil or when bolls were buried in the month of March. An irrigation of surface bolls increased the survival. March burial of 4 in. produced greater mortality than December burial at the same depth, without irrigation in either case. Immediate irrigation of bolls buried 4 in. caused much greater mortality under certain conditions than occurred in bolls buried the same depth but not irrigated, but three-year averages under such irrigation in all soil types studied and for all months show very little difference. Delaying irrigation three months after burial greatly increased survival over that in bolls buried 4 in. but not irrigated or in bolls buried 4 in. and irrigated at once. The survival in bolls in sandy loam was much lower than in bolls in silty-clay soil."

**No corn borers found in Illinois in 1931,** W. P. Flint, W. P. Hayes, G. H. Dungan, and A. L. Young (*Illinois Sta. Circ. 384 (1932), pp. 4, fig. 1*).—This circular (E. S. R., 64, p. 857) reports particularly upon infestation of corn varieties, 45 different strains of Illinois dent corn and 17 selections of sweet corn having been grown for one or more years in plats near Toledo, Ohio, to test their performance under corn-borer conditions, the details being reported in tabular form.

Among the strains grown for four seasons, two continued to show low infestations and high yields, indicating resistance to the insect. Three strains grown for three seasons showed both high infestation and high yield, indicating tolerance and the ability to yield despite the borer. The difference in yield as a result of later planting is said to have been insignificant, although at harvest time the later-planted corn tested higher in moisture content and consequently was somewhat inferior in quality. While the results were not complete at time of writing, it appeared that some of the varieties would yield well in spite of infestations that averaged 10 borers to a stalk.

**Insecticidal control of the European corn borer: The problems involved and some experimental results,** C. H. BATCHELDER and D. D. QUESTEL (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1152–1167, pl. 1*).—This is a report upon the feasibility of employing insecticidal sprays as a means of controlling the European corn borer during the early phase of an infestation before the insect adopts the tunneling habit. The more important problems encountered in the use of insecticides for such a purpose included timing of applications due to variation in the period of oviposition, maintenance of a spray cover in important feeding areas such as interfoliar spaces, and application to tall varieties of late-maturing corn infested by the second brood in the two-generation area. Laboratory and field tests of insecticidal agents indicated that a suspension of acid lead arsenate in 1 per cent paraffin-oil emulsion was the most useful. The value of such a combination is attributed to depression of the surface tension of the material, which leads to further penetration of lead arsenate into interfoliar spaces where the insect habitually feeds during early instars.

**A preliminary report on large-scale bait trapping of the oriental fruit moth in Indiana and Georgia,** W. P. YETTER, JR., and L. F. STEINER (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1181–1197*).—This is a report on two 500-acre bait trap experiments against the oriental fruit moth initiated in 1930, one at Vincennes, Ind., and the other at Cornelia, Ga.

"At the former locality a molasses-citral bait failed to give any evidence of control. At Cornelia a peach juice-granulated sugar combination appeared to somewhat reduce the infestation; however, the light infestation and the unusual seasonal conditions apparently so affected the results that they are not convincing. The overwintering brood appeared larger in the baited area at Vincennes and in the unbaited area at Cornelia. A total crop failure in Indiana together with severe drought conditions complicated results. A large number of other possible bait solutions were tested at each locality. Among 414 solutions tested at Cornelia, over 40 proved superior to that used in the large area. The latter was less than 25 per cent as attractive as an ethyl cinnamate-medium brown sugar combination. At Vincennes the most attractive solution was a combination of methyl cinnamate and brown sugar.

"At Cornelia, 69 and 78 per cent recoveries were made within 5 days of marked moths released inside a 14-acre experimental block. Ten per cent of a release made in an unbaited peach orchard more than ¼ mile away was recovered in this small block. The average distance traveled was ⅛ mile. There is evidence that following emergence many oriental fruit moths travel more than 200 yds. before beginning to oviposit. Very few eggs were deposited by moths before their capture. Experiments with released moths indicate that a small baited block containing 1,000 traps or less, if surrounded by unbaited peaches, may draw more moths from the unbaited territory than were naturally present in the orchard baited. At both Vincennes and Cornelia the small 8- and 14-acre blocks containing experimental solutions averaged, respectively, 12 and 5 times as many moths per trap as the large 500-acre areas."

**Feeding tests of anopheline mosquitoes with leguminous plants,** G. H. BRADLEY (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1229-1233*).—The author's observations indicate that mosquitoes do not feed to any extent on either the blossoms or foliage of legumes, that legumes are not attractive to mosquitoes, and that when confined in cages with legumes mosquitoes obtain little, if any, sustenance from the plants. It is concluded that in the case of our principal malaria vector *Anopheles quadrimaculatus* Say, at least, there is little likelihood of its ever obtaining this sustenance by feeding on legumes.

**Experiments with copper carbonate, lead arsenate, and other compounds against the Mediterranean fruit fly in Florida,** R. L. MILLER and O. C. MCBRIDE (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1119-1131, figs. 2*).—Copper carbonate in a solution of sirup and sugar was found to be almost as toxic to the Mediterranean fruit fly as was lead arsenate. Many copper compounds and others were found to be quite toxic. Toxicity was reduced by low temperature, low concentration, and alkalinity of the insecticide mixture. The kill was slower with flies that had previously fed well on normal food, and it was reduced by reducing the area covered by the insecticide. Humidity, light, and pressure affected toxicity very little. Copper carbonate had little effect on citrus trees or fruit, whereas lead arsenate caused many leaves to drop and reduced the anhydrous citric acid.

**The pale-striped flea beetle, a pest of young seedling onions,** C. J. DRAKE and H. M. HARRIS (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1132-1137, figs. 2*).—This is an account of the pale-striped flea beetle as a pest of onions in Iowa. The work of the larvae of this pest is generally overlooked by the grower or is confused with that of the various species of onion maggots, due largely to the fact that they are small and difficult to find, feed beneath the surface of the soil on the outside of the plantlet, and remain in the ground when the seedling is pulled out by hand. In one field investigated June 5 in Mitchell County their feeding had resulted in the total destruction of 8 acres of seedling onions. In another field of 13 acres the loss was conservatively estimated at 75 per cent of the young plants. On a farm adjoining the latter field the larvae had taken about 10 per cent of the seedlings in a 20-acre field.

**Apiculture,** H. W. ALBERTS (*Alaska Stas. Rpt. 1930, pp. 36, 37*).—A brief account is given of the history of colonies of bees introduced into Alaska and the winter losses that have followed. It is concluded that when bees are to be overwintered in an unheated building in Alaska they should be protected against dampness by placing a super or a half super filled with dry moss immediately over the frames. At Haines, about 500 miles southeast of Anchorage, in southeastern Alaska, three of five colonies kept in an open shed with plentiful stores survived the winter of 1929-30. From these, three new swarms emerged during the summer of 1930, two colonies dying during the summer. Yields of only 50 lbs. of honey were obtained during the summer, this having been about one-fourth of the usual amount. A colony of bees purchased in the spring of 1929 by a resident of Wrangell primarily for cross-pollination of his fruit trees produced one new swarm and yielded 210 lbs. of honey during that season.

**A discussion of Smith and Flanders' Trichogramma fad query,** A. W. MORRILL (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1264-1273*).—This is an analytical review of the contribution previously noted (E. S. R., 65, p. 856).

**Studies of insect pests** (*South Carolina Sta. Rpt. 1931, pp. 63-73, 99-101, figs. 3*).—The occurrence of the Japanese beetle in South Carolina is reported, 4 living specimens having been caught in baited traps in June, 1931, at Charleston.

In a study of the southern cornstalk borer at Clemson College and at Florence by O. L. Cartwright, the difference in 1931 in time between initial appearances of comparable stages of its life cycle was found to be from 5 to 11 days. Three general emergence periods of adult moths were observed both at Florence and Clemson College, although the third emergence at Clemson College was comparatively small. A large percentage of first-generation larvae at Clemson College entered hibernation, as did a very large percentage of the second brood. Seventy-seven per cent of the larvae under observation from eggs of the first generation laid on or after July 6 assumed overwintering conditions and prepared for hibernation. At Clemson College pupae producing first-flight moths averaged 19 days for their pupal periods, with a maximum of 28 and a minimum of 13; second emergence pupae averaged 11.96 days; and the third averaged 13.66 days. Oviposition at Clemson College for 121 cages averaged 294 eggs per female, with a maximum record of 627 eggs. This borer was found in the field feeding in sorghum and in a species of grass, *Paspalum scrobiculatum*. Its life cycle at both localities is graphically illustrated in chart form. Infestation of 100 per cent of the stalks, with 90 per cent containing live borers, and a population of 3,150 larvae per 1,000 stalks was discovered during the winter of 1930 at Florence.

A study of the life history of the corn billbug *Calendra callosus* at Florence during the year by Cartwright revealed the fact that it is able to live through two years and lay eggs throughout two growing seasons.

In observations of the Mexican bean beetle by F. Sherman, 33 per cent of the 500 beetles in each of two cages placed in a sheltered location in a wooded ravine in late September survived, while only 2 per cent of 500 in a similar cage with similar material inside placed in an exposed location on top of a hill at the same time survived. The period of emergence extended from April 13 to June 17, 1931, but the vast majority emerged from May 22 to June 15. Tests were made of insecticides for control of the Mexican bean beetle, in which magnesium arsenate, calcium arsenate, and barium fluosilicate were used, mixed with hydrated lime as dry dust applications and also mixed in water as a liquid spray. The use of magnesium arsenate at the rate of 1 lb. to 3 lbs. of lime as a dust and also 1 lb. to 50 gal. of water gave good results.

In spraying work with potato by Sherman the highest yield was obtained from the plat to which poisoned Bordeaux mixture was applied.

A brief account is given of control work by W. C. Nettles with the oriental fruit moth, particularly the introduction of parasites. A report of studies of this pest by Eddy and Nettles has been noted (E. S. R., 66, p. 53). The colonization of *Macrocentrus ancylivora* in the State was continued during the year, and colonies were liberated in 20 orchards. The parasite *Glypta rufiscutellaris* was introduced from New Jersey and liberated in orchards.

Work with the codling moth is also reported upon by Nettles. Studies of the past two seasons indicate that it normally produces three generations per season in South Carolina, with also a partial fourth generation which has not done serious damage. The percentage of parasitism of the eggs by *Trichogramma minutum* Riley increased from 17.4 per cent for the first generation to 54.7 for the second and 67.5 for the third. Preliminary studies were undertaken by Cartwright and Nettles to determine the strain or strains of *T. minutum* which are active in the State and to obtain data on the relative fecundity of these native strains. The complete data obtained indicate but slight difference in developmental periods between the form imported from Ohio and the South Carolina form, but show a noticeable difference in the fecundity of the two in favor of the South Carolina form.

Preliminary experiments with thrips on seedling cotton, reported upon by J. G. Watts, indicate that the several species implicated, including the tobacco thrips previously reported upon (E. S. R., 65, p. 155), are about equally affected by the several sprays and dusts tested. Nine complete generations of the flower thrips, one of the species discovered in destructive numbers on cotton, were reared in the laboratory from April 16 to September 13. Details of its life cycle are shown in chart form, and the average duration of the several stages in tabular form. In control work with sprays, pyrethrum at a strength of 1 part to 400 parts of water gave a considerable decrease in the number of thrips and gives promise as a control material. Pyagra at a strength of 1 part to 400 parts of water gave questionable results, but the effect was improved when soap was added at the rate of 1 cu. in. per gallon of liquid. Nicotrol, at a strength of 1 part to 200 parts of water gave some decrease of thrips. Nicotine sulfate at a strength of 1 part to 500 parts of water did not give very convincing results, but a combination of Penetrol and nicotine sulfate was promising. In preparing this, 20 parts of Penetrol were combined with 1 part of nicotine sulfate and of this solution 1 part was mixed with 200 parts of water. In work with dusts, sulfur, talc, and calcium arsenate were each tried without encouraging results. A mixture of equal parts of pyrethrum and talc gave some degree of control. A mixture of equal parts of pyrethrum and hydrated lime gave considerable reduction in thrips and gives some promise. It is pointed out that cultural practices play an important part in efforts to control thrips, as several fall-planted grains harbor several species of thrips through the winter.

An account of boll weevil activity in cotton fields by the Pee Dee Substation, as determined in cooperative work with the U. S. D. A. Bureau of Entomology, the results of poisoning, and observations of emergence from hibernation cages, by F. F. Bondy, are also noted. In poison tests, infestation counts showed the 1 : 1 : 1 molasses mixture to give good early control; when this was followed by calcium arsenate a good control was secured throughout the growing season. Calcium arsenate dust applications alone gave good control throughout the season, but sodium fluosilicate failed to control the weevil in these tests. In hibernation work, 5.98 per cent of the 20,000 weevils placed in 48 cages between September 1 and November 7 emerged during the season, as compared with 4.8 per cent in 1930 and 14.2 per cent in 1929.

**The use of insecticides on pineapple plants in Hawaii,** W. Carter (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1233–1242, pls. 2*).—In work conducted at the Hawaiian Pineapple Canners' Experiment Station, the use of oil emulsions proved to be a satisfactory method of control against the pineapple mealybug. The search for suitable parasites, however, is being continued.

**Some observations on electrified screens and traps,** R. W. Wells (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1242–1247, pl. 1*).—Tests made of electrified screens and traps as compared with the much used trap of the cylinder type are reported upon. The respective catches obtained are analyzed by species and percentages given, as are recorded observations on rather complete installations of electrified screens on farm buildings and general observations from intimate experience with their use experimentally.

**The adhesive strength of arsenical insecticides,** I. A. Parfentjev (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1261–1263*).—An apparatus is described, the use of which has been found very practical and convenient for measuring the comparative adhesiveness of dry powder insecticides.

**Some factors affecting the composition of dry lime-sulfur solutions,** D. E. Bullis (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1247–1252*).—This is a report from the Orgeon Experiment Station of a study made of the factors affecting the composition of solutions made from dry lime-sulfur.

The results show that "the value of solutions of dry lime-sulfur for scalicidal purposes may be increased, first, by allowing a longer time for solution to take place; second, and most important, by increasing the temperature of the water used to prepare the solution; and third, and less important than temperature, by improving the monosulfide: sulfide ratio through increasing up to about 50 lbs. the amount of dry material added to each 100 gal. of water. A combination of temperature increase and higher concentration of dry material produces a spray solution, the analysis of which approximates very closely that of a good quality liquid lime-sulfur, and it is believed that when used at equivalent strength should give as satisfactory control of scale insects."

**Use of wetting or degumming agents in the removal of spray residues from apples,** H. C. McLean and A. L. Weber (*Jour. Econ. Ent., 24 (1931), No. 6. pp. 1255–1261, pl. 1*).—Numerous experiments conducted at the New Jersey Experiment Stations led to the development of a new method of removing spray residues from fruit. "By the addition of a textile wetting or degumming agent to a hydrochloric acid cleaning solution, it was found possible to economically and satisfactorily remove arsenical residues from New Jersey apples receiving six to eight heavy applications of lead arsenate in cover sprays, of which one to four contained oil emulsion. A heated cleaning solution was necesssary only in one instance. Rapid and effective contact is established between the acid and lead arsenate by the use of wetting or degumming agents."

## ANIMAL PRODUCTION

**[Nutrition studies at the New York Cornell Station]** (*New York Cornell Sta. Rpt. 1931, p. 31*).—Two studies are noted.

*The effect of cellulose on the fecal excretion of water and the absorption of phosphorus from the intestinal tract*, C. M. McCay and B. S. Sehgal.—In studies with rats it was found that when 20 per cent by weight of the food of an otherwise adequate diet consisted of cellophane, the fecal bulk was increased about three times. The water excretion in the feces also increased about three times, and the amount lost in this manner was about the same as when equal amounts of bran, beet pulp, alfalfa hay, timothy hay, and agar-agar were fed. Both tricalcium and monocalcium phosphate were slightly less efficiently absorbed in the presence of 10 per cent of cellophane.

*Fish meal studies*.—In studies with rats L. A. Maynard and C. M. McCay found that vacuum-dried cod-and-haddock meal was rich in vitamin A, while flame-dried and steam-dried menhaden meals showed little, if any, of this vitamin. Growth studies showed the proteins of the vacuum-dried product to be superior to those of the flame-dried menhaden, while the steam-dried meal was intermediate in this respect. There were also indications that the vacuum-dried meal was superior in regard to one or more of the substances in the vitamin B complex.

B. H. Schneider found that the proteins of the vacuum-dried meal and the steam-dried menhaden meal were superior in both digestibility and biological value to those of flame-dried menhaden meal for rats, and preliminary results with pigs confirmed these results.

**Commercial feeding stuffs,** L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 337 (1931), pp. 55*).—This is the usual report of the analyses for protein, fat, and fiber of 1,748 samples of feeding stuffs collected for official inspection during April and August, 1931. The brands fulfilling their guaranties and the analyses of brands failing to meet their guaranties are listed (E. S. R., 66, p. 161).

**[Cattle studies at the Fairbanks Station],** H. W. Alberts (*Alaska Stas. Rpt. 1930, p. 33, fig. 1*).—During the winter the Galloway-yak hybrids consumed an average of 2 tons of oat straw and 500 lbs. of oat hay. A yak cow fattened on peas and oat hay was slaughtered and found to be in excellent condition. The live weight of the animal was 680 lbs. and the dressed weight 365 lbs. The meat was much like beef in appearance and taste.

**[Beef cattle experiments in Colorado]**, G. E. MORTON (*Colorado Sta. Rpt. 1931, pp. 15, 16*).—Two of these studies have been continued (E. S. R., 63, p. 556).

*Summer fattening experiment with cattle.*—Beef calves that had been carried through the winter on roughage were fed during the summer on alfalfa and Morton's pasture grass mixture with and without a heavy feed of linseed meal and cottonseed meal. Two lots of cattle were also fed in dry lot with and without a protein supplement. The heavy protein feed had no effect on the color of the fat. The highest net returns were secured from the cattle pastured on alfalfa, and the next highest from those pastured on the grass mixture without protein supplement.

*Winter maintenance experiment with pasture cattle.*—Stacked beet tops, although furnishing a satisfactory, cheap roughage, were not so efficient as corn silage. The tests indicated that stacked tops, after going through the fermentation process, could be fed without harmful effects.

*Wintering experiment with heifer calves.*—A group of 9 heifers fed during the winter on North Park hay and 0.5 lb. of cottonseed cake per head daily weighed 96 lbs. more than similar heifers receiving no cake.

**Wintering test of beef cattle**, E. D. KYZER and T. M. CLYBURN (*South Carolina Sta. Rpt. 1931, pp. 87, 88*).—A ration of sorghum silage, oat straw, and cottonseed meal was fed to a lot of 10 purebred Angus cows at the Coast Substation, while a similar lot received corn stover, oat straw, and cottonseed meal. The animals were successfully wintered on rations made up largely of dry roughage. The cost of wintering a cow of 112 days was $13.82 in lot 1 and $11.63 in lot 2.

**Molasses for fattening steer calves**, P. GERLAUGH (*Ohio Sta. Bimo. Bul. 154 (1932), pp. 7, 8*).—Continuing this study (E. S. R., 64, p. 368), 5 lots of 20 calves each averaging approximately 405 lbs. per head were fed for 280 days. All the lots received 6.5 lbs. of silage. 1.5 lbs. of mixed clover and timothy hay, and all except lot 5 were full-fed shelled corn. The first 4 lots were fed 2 lbs. of a mixture of equal parts of linseed meal and cottonseed meal, while lot 5 received 1 lb. of this supplement. Cane molasses was fed at the rate of 2, 1, 0.5, and 1 lb., respectively, in the last 4 lots. Lot 5 was fed the same amount of corn at lot 3 with the addition of 1 lb. to replace the supplement.

The average daily gains were 2.1, 2.2, 2.2, 2.1, and 2.1 lbs. per head in the respective lots. The calves in lot 2 were fatter than those in lot 1 after being on feed 4 months. Lot 3 calves did not equal lot 1 calves in condition until they had been on feed 7 months, while lot 4 approximated lot 1 in gains, growth, and condition throughout the test. It was found that 2 lbs. of molasses was too much for economical fattening of calves. Lot 5 did not gain as well as the other lots during the first 6 months of the test, but during the latter part gained exceptionally well and finished as one of the most desirable lots.

**[Sheep studies at the New York Cornell Station]** (*New York Cornell Sta. Rpt. 1931, pp. 32–34*).—Some of these studies have been continued (E. S. R., 64, p. 659).

*The relation of feeding and management to the "stiff lamb" trouble*, J. P. Willman, S. A. Asdell, W. T. Grams, and W. A. Hagan.—In this year's test the ewes were changed from lot 1 to lot 2 and vice versa, and a few additional ewes were added to both lots. All of these ewes had been the dam of at least one "stiff lamb" previously. About 40 per cent of the lambs in lot 2 became characteristically stiff and showed the typical muscular lesions on post-mortem examination. No "stiff" lambs were found in lot 1. These results indicate that "stiff lamb" disease may be caused or prevented by feeding and management.

*The effect of docking and castrating male lambs on the gains and the value and quality of the carcasses as food,* R. B. Hinman, J. P. Willman, and C. D. Schutt.—During a 98-day feeding period there was no significant difference in the gains of ram and wether lambs fed the same ration.

*A comparison of various instruments for docking lambs,* J. P. Willman.—There was no significant difference in the gains made by lambs docked either with a sharp knife, the emasculator, or the emasculatome, or of lambs left undocked. The wounds from docking with the emasculator did not heal as quickly as did those made by the other methods.

**Winter lamb-feeding experiment at Akron,** G. E. MORTON (*Colorado Sta. Rpt. 1931, p. 17*).—Sudan meal was found to be a valuable home-grown protein feed, and when used in equal parts with cottonseed meal gave very satisfactory results. In these tests hog millet was found to be 83 per cent as valuable as corn. "Native" and "western" lambs gained at approximately the same rate. and the cost of the gains was about the same. Wether lambs gained faster, required less feed, and the feed cost per unit of gain was lower than with ewe lambs.

**Length of feeding period and plane of nutrition as factors in lamb feeding,** A. D. WEBER, W. J. LOEFFEL, and M. PETERS (*Nebraska Sta. Bul. 262* (*1931*), *pp. 39, figs. 11*).—Continuing this study (E. S. R., 65, p. 858), the two tests showed that lambs fed alfalfa hay only for 56 days remained thrifty but gained only 1.5 lbs. per head. During the subsequent 84-day full-feeding period they gained 7 lbs. more per head than similar lambs that had not been on a maintenance ration. The former lambs ate the same amount of corn and twice as much hay as lambs full-fed for 84 days. A maintenance period before instead of after full-feeding resulted in the consumption of more hay and less grain, the lambs were more uniformly finished, and it was the most effective manner of prolonging the feeding period.

Full-feeding corn and alfalfa for 84 days produced the best grade of carcass, and further feeding decreased the grade. Holding full-fed lambs to constant weight kept the carcasses within the desired weight limits, but the grade of carcasses deteriorated. Lambs on a maintenance ration for 56 days and full-fed for 84 days produced carcasses of desirable weight and quality.

The accumulation of kidney fat increased the percentage of loin as lambs fattened. The percentage of rack remained quite uniform at 9.5 per cent, while the percentage of leg decreased with increased fatness. The percentage of bone in the short rack decreased from 21 to 12 per cent as the finish increased. Full-feeding tended to decrease the percentage of water in the tissues and to some extent the percentage of protein and ash, while the ether extract increased. Maintenance feeding reversed this process.

Choice carcasses were found to contain 44 per cent of fat, good carcasses 35.5 per cent, medium 30.5, and common carcasses 28 per cent of fat. Following maintenance there was no apparent softening of the kidney fat as indicated by the refractive indexes. Cooking losses through evaporation remained fairly constant at 8 per cent. Dripping losses appeared to be directly correlated with degree of fatness varying from 3.03 to 7.83 per cent. Roasting time for legs was approximately 30 minutes to the pound regardless of weight or fatness. The fatter roasts seemed to have a more desirable flavor of both fat and lean. The amount and richness of juice had some correlation with fatness.

**[Swine tests at the Matanuska Station]**, H. W. Alberts (*Alaska Sta. Rpt. 1930, pp. 19, 20, fig. 1*).—Continuing this work (E. S. R., 64, p. 759), a group of 3 sows and 4 barrows averaging 48 and 41.5 lbs. per head, respectively, were turned on oat, pea, and rape pasture on July 1. In addition each animal received approximately 2 lbs. of skim milk and 1 lb. of a mixture of ground barley and oats. By September 15 the barrows had made average gains of 56.5 lbs. and the sows 58.6 lbs. At this time the grain supplement was increased to 2 lbs. and the skim milk to 3 lbs. per pig daily. From September 15 to October 15 the barrows gained 8.7 lbs. and the sows 13.4 lbs. per head.

**[Swine studies in Colorado]**, G. E. Morton (*Colorado Sta. Rpt. 1931, pp. 16, 17*).—Three studies are noted.

*Pea field hog feeding experiment.*—Pea field pasture alone proved to be unsatisfactory for swine. On such feed it required 931 lbs. of peas to produce 100 lbs. of gain. Barley was found to be a valuable supplement to pea-field pasture. A protein supplement was essential for this type of feeding, and alfalfa meal proved to be satisfactory under these conditions.

*Summer pig feeding experiment at Akron.*—A group of 40 pigs self-fed grain for 140 days on a succession of annual pastures, including fall-sown rye, spring-sown barley, and Sudan grass compared favorably in rate and economy of gains with similar pigs fed the same ration in dry lot.

*Winter pig feeding experiment at Akron.*—Continuing this study (E. S. R., 62, p. 254), millet did not show as high a feed replacement value as previously because of the better grade of corn used and also because the millet was not completely ground. A mixture of grains again increased the palatability of the ration, while a protein supplement was found necessary for best results. The mixture of tankage, cottonseed meal, and alfalfa meal proved to be somewhat bulky for the small pigs.

**Field peas for fattening pigs**, H. B. Osland and G. E. Morton (*Colorado Sta. Bul. 381 (1931), pp. 18, figs. 3*).—Two feeding tests were conducted to determine the value of different feeds and combinations of feeds and also the value of different supplements to grain rations for fattening pigs on pea fields. In the first test 9 lots of 10 pigs each, averaging about 63.5 lbs., were fed for 105 days, while in the second test 9 lots of 8 pigs each, averaging 80.6 lbs., were fed for 98 days.

The results of these two studies showed that unsupplemented pea-field pasture produced poor and uneconomical gains. Barley was found to be a good grain supplement, while alfalfa meal, tankage, and skim milk costing less than 35 cts. per hundredweight were satisfactory protein supplements. Cull potatoes apparently had a beneficial effect upon the pigs and also reduced the cost of gains.

**[Swine studies at the New York Cornell Station]** (*New York Cornell Sta. Rpt. 1931, pp. 34, 35*).—Two studies are noted.

*Prevention of anemia in suckling pigs.*—Continuing this work (E. S. R., 64, p. 664), J. P. Willman and C. M. McCay found that pigs usually did not become anemic if they were drenched at least twice a week for the first 4 weeks of their lives with a solution of crude ferrous sulfate and if they had free access after 14 days to a feed mixture containing 0.1 lb. of ferrous sulfate per 100 lbs. of feed. Painting the sow's udder three times daily with a concentrated solution of ferrous sulfate also prevented anemia, although the hemoglobin in the blood of such pigs was less than in that of pigs that were drenched. Adding iron salts to the feed or to the feed and water did not prevent anemia.

McCay and Willman compared a highly purified ferrous sulfate (free from copper) with a crude ferrous sulfate (containing traces of copper) and found no difference in their ability to prevent anemia. However, it was possible that the milk or other feeds consumed contained copper.

*Ground grape seeds for swine*, F. B. Morrison and J. P. Willman.—"Grape seeds," a by-product of the manufacture of grape juice consisting of the ground seeds and skins of grapes, was found to contain 47.1 per cent of fiber. When used as a feed for pigs, this product did not have sufficient feeding value to justify its use when used as the sole feed or when forming from 50 to 75 per cent of a mixture with hominy feed, fish meal, linseed meal, and chopped alfalfa hay.

[**Swine studies in South Carolina**] (*South Carolina Sta. Rpt. 1931, pp. 42, 43, 44, 86, 87, fig. 1*).—Several studies, some of which have been continued (E. S. R., 64, p. 663), are noted.

*Protein supplements to corn for fattening hogs in dry lot*, E. G. Godbey.—In this test free choice feeding produced somewhat faster and more expensive gains than hand-feeding when a soybean supplement was fed. When cottonseed meal was used the two methods of feeding resulted in approximately the same rate of gain, but the free choice pigs consumed less supplement and made somewhat more economical gains. The cottonseed meal mixture when fed either by hand or free choice produced larger and more economical gains than the soybean meal mixture.

*A study of the influence of soybeans when fed with limited and full rations of corn and corn and tankage on the hardness of fat in hogs*, E. G. Godbey.—Corn and tankage was fed in both limited and full amounts to 6 lots of pigs on green soybean and alfalfa pasture during the first part of the test and full-fed free choice during the last part. The pigs on forage made faster and more economical gains than the check lot. Soybean pasture produced cheaper and more rapid gains than alfalfa. The pigs which received 2.5 per cent of corn and tankage (14:1) on soybean pasture to 100 lbs. of live weight and corn and tankage free choice thereafter made the most rapid and economical gains in this test.

*Forage crops for fattening hogs*, E. D. Kyzer and T. M. Clyburn.—At the Coast Substation 4 lots of 10 pigs each were full-fed corn, fish meal, and minerals on 1-acre plats of the following forages: Rape, barley, Austrian peas, and a mixture of oats, rye, and barley. A check lot was fed the same ration in dry lot. The pigs required the following number of days to reach 200 lbs. of live weight from an average initial weight of 58 lbs.: Barley, 80 days; rape, 82 days; dry lot, 85 days; mixture, 86 days; and Austrian peas, 92 days. The most economical gains were made in the barley lot, followed in order by rape, mixture, dry lot, and Austrian peas. All the forages were readily consumed except Austrian peas.

**Barley as a grain for the work horse**, M. W. Harper (*New York Cornell Sta. Rpt. 1931, p. 32*).—One horse in each of seven teams was fed a grain ration consisting of 50 per cent of rolled barley and 50 per cent of rolled oats, while its team mate received a mixture of 50 per cent of rolled barley, 40 per cent of hominy meal, and 10 per cent of bran. During the preliminary feeding two horses receiving the barley-hominy-bran ration had slight digestive disturbances, but after the animals became accustomed to their feed neither ration had any bad effects. While both rations were palatable, the barley-oats mixture was somewhat more efficient in maintaining body weight.

**Prevention of growth of spurs on male birds**, L. W. Smith (*South Carolina Sta. Rpt. 1931, pp. 85, 86, fig. 1*).—A total of 64 male chicks were treated at from 8 to 12 weeks of age to prevent the development of spurs. At this age the spur cap was removed with a knife, and when the blood started to flow a small amount of potassium hydroxide was applied by rubbing into the wound. At 6 months of age no spurs had developed.

**Calcium and phosphorus requirements for growing chicks, I, II,** W. C. Tully, S. M. Hauge, C. W. Carrick, and R. E. Roberts (*Poultry Sci., 10 (1931), No. 6, pp. 299–318, figs. 2*).—The Indiana Experiment Station reports results of two studies.

I. *Studies with salt mixtures under rachitic conditions* (pp. 299–309).—The general plan of the four trials in this study as regards the varieties of chicks used and the methods of selection, feeding, and management was the same as previously noted (E. S. R., 59, p. 567). The mineral mixtures used in the various lots were either McCollum's Mineral No. 185 or modifications of it.

It was found that these mineral mixtures, when used with a semipurified ration in the absence of vitamin D, did not produce satisfactory growth or normal bone formation. When vitamin D was added, the chicks approached optimal growth. In the absence of vitamin D, 6 or 8 per cent of a mineral mixture with a calcium-phosphorus ratio of 1:0.608 produced better results than 4 per cent of the mixture. In this study good growth was not obtained when young chicks were fed a mineral mixture made up chiefly of dibasic calcium phosphate, either with or without an adequate supply of vitamin D in the form of irradiation.

II. *Studies with natural minerals under rachitic conditions* (pp. 310–318).—In this phase of the study four trials were conducted with Barred Plymouth Rock chicks using natural minerals as sources of calcium and phosphorus. The results showed that oyster shell and steamed bone meal or limestone grits and steamed bone meal were superior to mineral salts as sources of calcium and phosphorus in the absence of vitamin D. A calcium-phosphorus ratio of about 1:0.3 produced the best results. Limiting the phosphorus content of the ration to 0.66 or less per cent noticeably reduced the rate of growth. In these studies no combinations of minerals were found that would prevent rickets in the absence of vitamin D.

**Calcium phosphorus metabolism in the chicken.—III, The influence of cereals and vitamins (A and D),** E. J. King and G. E. Hall (*Poultry Sci., 10 (1931), No. 6, pp. 332–352, figs. 3*).—Continuing this series (E. S. R., 65, pp. 558, 877), 8 lots of 30 chicks each were fed for 12 weeks a basal ration composed of yellow corn, wheat, meat meal, buttermilk powder, calcium carbonate, and salt. Lot 1 received the basal ration only, while the remaining lots received in addition 1 drop of 250 D irradiated ergosterol per bird daily; 1 drop of carotene in olive oil solution; 20 per cent of ground oat groats; 20 per cent of ground oat groats and 1 drop of irradiated ergosterol; 20 per cent of ground oat groats and 1 drop of carotene; 20 per cent of ground oat groats, 1 drop of ergosterol, and 1 drop of carotene; and 20 per cent of boiled oats, respectively.

Normal birds were produced when 1 drop of irradiated ergosterol per bird daily was added to the rachitic-producing basal ration. The addition of oatmeal to the ration resulted in a more severe rachitic condition of the birds, but the ergosterol tended to overcome this influence of the oatmeal. Adding vitamin A in the form of carotene did not improve the condition of the birds. Prolonged boiling of oats with hydrochloric acid, without subsequent dialysis, seemed to render the anticalcifying property of the oats more available.

**The vitamin A content of a ration and the antirachitic potency of irradiated ergosterol,** W. C. Russell and D. Klein (*Poultry Sci., 10 (1931), No. 5, pp. 269–274, fig. 1*).—At the New Jersey Experiment Stations, White

Wyandotte chicks were divided into 6 lots of 40 each, and all lots were fed the same basal ration. Dried carrots, which were used as a source of carotene, were prepared by drying thin slices in a warm current of air at from 45 to 50° C. for 48 hours, and then ground. Lots 1, 3, and 6 received 3 per cent and lots 2 and 4 6 per cent of the dried carrots. Irradiated ergosterol in corn oil was prepared in 2 solutions, known as solution A, which was diluted to contain 0.006 mg. of sterol per cubic centimeter, equivalent to 15 rat units, and solution B containing 0.06 mg., equivalent to 150 rat units. Lots 1 and 2 received 1 per cent of solution A, and lots 3 and 4 1 per cent of solution B. Lot 5 received 1 per cent of cod-liver oil.

The percentage of ash in the bones from about 1 to 9 weeks of age did not show that 6 per cent of dried carrots enhanced the antirachitic potency of irradiated ergosterol sufficiently, even when it was used in an amount equal to 6 times the potency of cod-liver oil to make it equivalent in its action to the latter substance. The increased dosage of irradiated ergosterol in lots 3 and 4 caused an increase in the ash content of the bones as compared with lots 1 and 2. The inorganic phosphorus values of the lots which received ergosterol were generally higher than those of the basal group. The antirachitic factor did not occur in carrots in detectable amounts.

**Feeding moldy corn to young chickens,** S. E. Ronk and C. W. Carrick (*Poultry Sci., 10 (1931), No. 5, pp. 236–244, figs. 3*).—In this study at the Indiana Experiment Station two series of trials, using three groups of Barred Plymouth Rock chicks in each, were conducted to determine whether moldy corn could be safely fed. The good corn used graded as No. 2. Chemical analyses showed little difference in the two samples of corn. The moldy corn was found to be infected with species of Penicillium, Diplodia, Fusarium, Mucor or Rhizopus, Aspergillus, and undetermined organisms, including yellow bacteria.

In these tests chicks receiving 20 per cent of moldy corn grew at the same rate as those fed 50 per cent of No. 2 corn. In each trial the pens receiving 20 per cent of moldy corn grew somewhat faster than those receiving larger amounts, although there were no mortalities in lots receiving 30 and 40 per cent of such corn. The tests also revealed no difference in the rate of growth of chicks kept on wire mesh floors and those with shavings for litter.

**The control of cannibalism in battery brooders and fattening batteries,** J. S. Carver (*Poultry Sci., 10 (1931), No. 5, pp. 275–277*).—At the Washington Experiment Station a natural-colored ruby Mazda 60-watt light was found to prevent cannibalism in chicks that had not acquired the habit and immediately arrested cannibalism in batteries where it was in progress. Such a lamp made it impossible for the chicks to distinguish blood on the shaft at the base of the new succulent rapidly growing feathers. The light should be arranged so that all the feed hoppers are lighted, but only a small amount of light is admitted to the battery compartments. Similar results were obtained by the use of a spotlight with a medium red Transolene color media arranged on the ceiling, using a 200-watt bulb as a source of light.

**The selection of eggs and baby chicks for exhibition,** W. C. Thompson (*New Jersey Stas. Hints to Poultrymen, 20 (1931), No. 3, pp. 4, fig. 1*).—Points to be considered in the selection of eggs and baby chicks for exhibition purposes are discussed.

## DAIRY FARMING—DAIRYING

**[Dairy cattle experiments at the Matanuska Station],** H. W. Alberts (*Alaska Stas. Rpt. 1930, pp. 16–19*).—Continuing this work (E. S. R., 64, p. 767), the average daily production of 5 Holstein cows during the first 100 days of lactation was 39 lbs. of milk containing 3.2 per cent of butterfat. During the same period 5 Galloway-Holstein cows produced an average of 41.2 lbs. of milk containing 3.9 per cent of butterfat.

A feeding test was conducted to determine the ability of 12 dairy cows to make gains on locally grown feeds during the winter and on pasture during the summer. In the winter silage was fed at the rate of 30 lbs. and oat pea hay at the rate of 12 lbs. per 1,000 lbs. of live weight, to which was added 1 lb. of equal parts ground oats and ground barley for animals under 1 year of age. During the winter the animals made average daily gains of 181.2 lbs. and during the summer 183.3 lbs. per head.

[**Experiments with dairy cattle**] (*New York Cornell Sta. Rpt. 1931, pp. 26–30*).—Several studies, some continued (E. S. R., 64, p. 671), are noted.

*Proper amount of protein for dairy cows*, E. S. Savage, E. S. Harrison, and S. H. Work.—The cows receiving the 16 per cent protein concentrate during the first 40 weeks of the second lactation period averaged 9,558.1 lbs. of milk and 299.8 lbs. of fat, those receiving the 20 per cent protein mixture averaged 9,690.8 lbs. of milk and 318.9 lbs. of fat, and those receiving the 24 per cent protein mixture averaged 9,803.7 lbs. of milk and 306.8 lbs. of fat. The cows in the first lot maintained their condition and general health as well as the animals in the other lots, and the breeding efficiency of all lots was very high. It was concluded that a 16 per cent protein mixture when fed with good quality mixed hay and corn silage at the rate of 1 lb. of concentrate to each 3.5 lbs. of milk produced as well as the higher protein mixtures.

*Raising dairy calves on dry concentrate mixtures*, E. S. Savage and C. H. Crawford.—Dry skim milk was compared with soluble blood flour alone and in combination with dry skim milk and also with a combination of corn sugar, white fish meal, and dry skim milk as supplements to a calf meal mixture. The dry skim milk alone produced greater gains in weight than any of the other protein supplements. The results also indicated that 22 per cent of dry skim milk was as effective for growth and development as larger amounts.

*Corn silage in the winter ration of yearling dairy heifers*, E. S. Harrison and N. A. Kahn.—A ration of 3 lbs. of a 12 per cent protein grain mixture and 15 lbs. of good quality mixed hay was fed to a lot of 9 Holstein heifers, while a similar lot was fed 3 lbs. of the same grain, 8 lbs. of the same hay, and 20 lbs. of corn silage. Over a 24-weeks period the average daily gains in both lots were 1.5 lbs. per head. There was no difference in the skeletal growth or development of the two groups. The addition of corn silage did not materially improve the ration, and under average conditions of the State added to its cost.

*A comparison of bedding materials for dairy cows*, E. S. Savage and R. Albrectsen.—In a study with 24 cows and heifers bedded with different materials for 2-weeks periods, it was found that when shavings were used the cost was 9.3 cts. per head daily, with chopped straw 3.4 cts., and with baled straw 2.5 cts.

*The influence of grain mixtures of different fat levels upon milk secretion*, L. A. Maynard, C. M. McCay, H. H. Williams, P. J. Schaible, and L. L. Madsen.—A group of 6 cows receiving a grain ration containing 7 per cent of fat produced more milk and fat than a similar group receiving the same mixture having its fat content reduced to 3 per cent by benzine extraction.

*The phosphorus distribution in the blood of lactating cows* C. M. McCay and L. A. Maynard.—A study of the blood of the above animals showed that the changes in the plasma lipid phosphorus which occurred with different levels of fat intake and fat secretion were accompanied by similar changes in the total phosphorus of the plasma. The phospholipids of the erythrocytes were unaffected, and there were no appreciable changes in other phosphorus constituents of the blood.

*Changes in the blood lipids during lactation*, L. A. Maynard, E. S. Harrison, and C. M. McCay.—Further work in this experiment confirmed the previous findings that the increase in blood lipids with the onset of lactation are not due solely to changes in food level but are a specific effect of mammary activity.

*Lactation studies with laboratory animals*, M. Kozlowska, C. M. McCay, and L. A. Maynard.—In studying the food factors which influence the secretion of milk in animals too small to be milked, the lactation period of the animals was prolonged by forcing the young to depend upon its mother's milk for food after the normal weaning time. With this technic it was found that low protein levels brought about a marked decrease in the secretion of milk by rats maintained on synthetic diets.

**[Dairy cattle studies in South Carolina]** (*South Carolina Sta. Rpt. 1931, pp. 57, 58–62, 114, fig. 1*).—The results of several studies are noted.

*Corn silage vs. ground corn fodder for milk production*, J. P. LeMaster and E. C. Eltin.—Using the double reversal method, 2 lots of 3 cows each were fed through 3 28-day experimental periods preceded by 10-day transition periods. The same basal ration was fed to both lots. One lot received corn silage, while the other lot was fed ground corn fodder. These feeds were fed on the same dry-matter basis, and on this basis had practically equal feeding value. The silage was more palatable than the fodder, and there was a tendency for cows to refuse small quantities of fodder at times.

*Supplementary feed requirements of cows on pasture*, E. C. Elting and J. P. LaMaster.—An unfertilized pasture, consisting largely of Bermuda grass with some Dallis grass, lespedeza, and carpet grass, was stocked with 10 milking cows at the rate of one animal per acre. The average milk production per cow from May 6 to October 13 was 19.7 lbs. per day. The daily supply of digestible nutrients required per head was 14.5 lbs., of which 10.8 was supplied by barn feeding and 3.7 lbs. from pasture. The pasture furnished 25.2 per cent of the nutrients obtained. The cows gained an average of 6.8 lbs. per head during the season.

*The value of cottonseed meal as a supplementary feed for dairy calves*, E. C. Elting and J. P. LaMaster.—Continuing this study (E. S. R., 64, p. 673), 3 lots of calves that had been weaned at 60 days of age were fed to 6 months of age on one or the other of 2 grain mixtures. Ration A consisted of ground yellow corn, ground oats, cottonseed meal, skim milk powder, and salt, and ration B of ground yellow corn, ground oats, cottonseed meal, and salt. Lot 1 received ration A for 6 months; lot 2, ration A for 3 months and B for 3 months; and lot 3, ration B for 6 months. At 1 month of age the calves were 93.7, 98.6, and 101.2 per cent normal for height at withers, and 86.1, 96.3, and 100.4 per cent normal in weight in the respective lots. At 6 months of age the respective lots were 98.8, 100.5, and 98.7 per cent normal in height, and 94.8, 110.1, and 102 per cent normal in weight. No scours or other abnormal conditions were apparent, and the calves were in excellent physical condition at 6 months of age.

*Whole cotton seed for dairy cows*, J. P. LaMaster and E. C. Elting.—In this study three tests were undertaken to determine the efficiency with which dairy cows could utilize whole cottonseed. The percentages of whole seeds recovered in the feces in the respective tests were 0.6, 0.1, and 0.2. These results showed that the loss due to whole seeds passing through the digestive tract was practically negligible.

*A study of calcium and phosphorus assimilation by dairy cows*, J. P. LaMaster, E. C. Elting, and J. H. Mitchell.—This study, which has been continued (E. S. R., 64, p. 673), was divided into two trials. The first trial was conducted with two dry mature Holstein cows near the end of their gestation periods, and the second trial was made with the same cows during the third month of the lactation periods following the first trial. In trial 1 the ration used consisted of corn silage, chopped soybean hay, and a mixture of equal parts of corn-and-cob meal, ground oats, wheat bran, and cottonseed meal. The ration in the second trial was made up of corn silage, soybean hay, beet pulp, and a mixture of corn-and-cob meal, ground oats, wheat bran, linseed meal, and cottonseed meal. In trial 1 the daily calcium balances were 10.21 and 10.25 gm. and the phosphorus balances were 4.02 and 5.45 gm. for the respective cows. While producing approximately 66 lbs. of milk daily in the second trial, the respective cows had calcium balances of 11.1 and 5.22 gm. and phosphorus balances of 6.04 and 6.13 gm. daily.

*Preliminary feeding trial with citron or stock melons*, E. W. Faires.—At the Sandhill Substation a test was undertaken to determine the palatability of citron or stock melons and to compare them with soaked beet pulp in a dairy ration. Apparently the melons were quite palatable, for one cow consumed an average of 108 lbs. daily for 10 days and another cow ate 100 lbs. daily for a similar period. Neither animal seemed to tire of the feed. The melons contained only 4.8 lbs. of nutrients per 100 lbs., and it required 3.7 lbs. of melons to equal 1 lb. of beet pulp. Over a 10-day period milk production was lower when melons were fed than when beet pulp was used.

**The supplemental value of fish meal as a feed for dairy cattle**, M. H. Campbell (*Vermont Sta. Bul. 333 (1931), pp. 19*) —Continuing this study (E. S. R., 65, p. 561), a lot of calves was fed a ration containing fish meal and was compared with a similar lot receiving linseed meal. The test was carried through two winters. There was no appreciable difference in the digestible protein and total digestible nutrients required per unit of gain in the two lots.

When fed to milking cows fish meal tended to lower the fat percentage of the milk, but had no apparent effect on total milk or on the solids not-fat fat content of the milk. Fish meal compared favorably with linseed meal and cottonseed meal on the basis of digestible protein and total digestible nutrients required to produce a unit of milk or butterfat. The fish meal was less palatable than the other protein supplements.

**Calcium and phosphorus requirements of dairy cows.—I, Weekly balances through lactation and gestation periods**, H. B. Ellenberger, J. A. Newlander, and C. H. Jones (*Vermont Sta. Bul. 331 (1931), pp. 27, figs. 13*).—Continuing this study (E. S. R., 65, p. 561), weekly calcium and phosphorus balances through the entire lactation and gestation periods have been completed for 6 such periods on 5 medium to heavy milking cows. Each animal ended its trial with positive balances. While mineral supplements shortened the negative balance periods, such periods appeared to be normal during the early part of lactation periods. The negative periods were overcome by rapid storage of minerals as the lactation and gestation periods progressed.

**Strawberries for ice cream manufacture**, N. E. Fabricius (*Iowa Sta. Circ. 132 (1931), pp. 12*).—This study was undertaken to determine the best method of flavoring strawberry ice cream, the time to pick strawberries for flavoring, the amount of sugar, and the temperature best suited to storage of strawberries, and to compare 18 varieties of Iowa-grown strawberries for use in flavoring. The ice cream mix used in the work was made up of 14 per cent of butterfat, 15 per cent of sugar, 9.7 per cent of milk solids-not-fat, and 0.3 per cent of gelatin. The berries were added to the mix in the freezer just before the brine was shut off, and the ice cream was drawn at 80 per cent overrun. All samples of ice cream were placed by from 24 to 32 persons.

Cold-packed strawberries were found to be superior to canned strawberries, and both were far superior to strawberry extract for flavoring ice cream. The extract was the cheapest source of flavoring and the canned strawberries the most expensive. The strawberries frozen with sugar at —20° F. were better than those frozen without sugar. The berries packed at the rate of from 2 to 3 lbs. to 1 lb. of sugar and frozen at —20° kept well at ordinary storage temperatures of from 15 to 25°. Higher storage temperatures were undesirable because they made necessary a sugar concentration which was unsatisfactory in mixes which were fairly high in sugar. Ripe strawberries and late-season strawberries were superior for flavoring to berries picked for shipment and early-season strawberries, respectively.

The varieties of strawberries differed in flavoring qualities, some giving an inferior product regardless of the quantity used. The varieties Gandy, Kellogg Prize, Early Jersey Giant, and Dunlap of the Iowa-grown berries appeared to be best suited for flavoring ice cream.

**Observations on the counting of bacteria in ice cream by the plate method,** N. E. Fabricius and B. W. Hammer (*Iowa Sta. Bul. 285 (1931), pp. 329–342*).—A comparison involving the bacterial counts secured, the agreement of counts with different dilutions, and the percentage of pin-point colonies was made between standard agar and standard agar plus 1 per cent of sucrose in the plating of ice cream and ice cream mix.

When standard agar was used serious discrepancies were found in the counts of plating of different dilutions, especially those involving from 1 to 1,000 and from 1 to 10,000 dilutions. However, these discrepancies did not occur when 1 per cent of sucrose was added, and the sucrose often resulted in such an increase in size of colonies that counting was considerably easier. A smaller percentage of pin-point colonies was encountered when standard agar plus sucrose was used, but there was also an increase in the size of colonies too large to be classed as pin points. Generally the sucrose added to standard agar had little effect on the count or size of colonies in ice cream of a low bacterial count.

Various types of organisms were found to be responsible for the pin-point colonies on plates poured with ice cream. Especially prominent were streptococci which formed acid in milk, some with coagulation and some without when incubated 2 days at 37° C. Alkali formers and digesters were also found. Many of the cultures obtained from pin-point colonies grew better in milk at 45° than at lower temperatures. Some of the alkali formers gave large colonies at 21° and pin-point colonies at 37°. The digesters when plated in pure cultures regularly gave large colonies.

## VETERINARY MEDICINE

**Treatise on microbiology, I,** edited by L. Nattan-Larrier (*Traité de Microbiologie. Paris: G. Doin & Co., 1931, vol. 1, pp. II+1099, pls. 8, figs. 166*).—In this volume, which consists of contributions by some 12 authors, the first part deals with the subject of immunity, immunization, and anaphylaxis (pp. 1–343), the second part with pathogenic fungi and the mycoses (pp. 345–517), and the third part with the pathogenic bacteria (pp. 519–1004).

**A text-book of general bacteriology,** E. O. Jordan (*Philadelphia and London: W. B. Saunders Co., 1931, 10. ed., reset, pp. 819, figs. 200*).—This is an entirely reset edition of the work previously noted (E. S. R., 59, p. 876), in which the author was assisted by W. H. Taliaferro in the preparation of the chapter on the parasitic protozoa and by N. P. Hudson in the section on yellow fever.

**[Contributions on animal pathology and parasitology]** (*N. S. Wales Dept. Agr., Vet. Research Rpt., 6 (1931), pt. 1–2, pp. 11–90, pls. 6*).—The contributions here presented are as follows: Infectious Pneumonia of Sheep, by W. L. Hindmarsh, T. T. McGrath, and H. G. Belschner (pp. 11–21); Studies in Infectious Ophthalmia of Sheep, by G. Edgar (pp. 22–35); Some Observations on the Treatment of Young Sheep for "Lungworm" (*Dictyocaulus filaria*) Infestation by Intratracheal Injections, by T. T. McGrath (pp. 36–39); Observations upon the Conditions Requisite for the Transmission of Gastro-Intestinal Nematodes of the Sheep, by H. R. Seddon and T. T. McGrath (pp. 40–57); Arsenical Poisoning in Stock from the Ingestion of Vegetation Sprayed with Arsenic, by A. A. Ramsay and H. R. Seddon (pp. 58–69); Poisoning of Sheep by the Seeds of Burrawang (*Macrozamia spiralis*), by H. R. Seddon, H. G. Belschner, and R. O. C. King (pp. 70–80); and Sterility in Dairy Cattle in New South Wales: A Summary of the Present Position, by W. L. Hindmarsh (pp. 81–90).

**Government of Northern Rhodesia, Department of Animal Health, annual report for the year 1930,** J. Smith, J. P. A. Morris, and R. A. S. Macdonald (*North. Rhodesia Dept. Anim. Health Ann. Rpt. 1930, pp. 30*).—This report (E. S. R., 65, p. 568) includes a section dealing with the occurrence of and control work with the infectious diseases of livestock by Morris (pp. 11–14).

**The poisonous principle of Lathyrus and some other leguminous seeds,** R. Stockman (*Jour. Hyg. [London], 31 (1931), No. 4, pp. 550–562, pl. 1*).—In studies of Lathyrus and other leguminous seeds, including lentils (*Ervum lens*), the common cultivated pea (*Pisum sativum*), soybean (*Soya hispida* (*Glycine hispida*)), tares (*Vicia sativa*), bittervetch (*E. ervilia*), and pigeon pea (*Cajanus indicus*), the author found the poisonous body to be an acid and apparently the same acid in all.

**Poisoning of livestock by plants,** H. W. Alberts (*Alaska Stas. Rpt. 1930, pp. 35, 36*).—Brief mention is made of cases of plant poisoning of livestock in Alaska in which the wild parsnip (*Cicuta douglasi*) and the larkspur (*Delphinium* sp.) were involved. The greatest number of cases have occurred in the spring when the ground is soft and the roots of the wild parsnip are easily pulled up. The tender tops do not seem to be harmful.

**The study of epidemic diseases among wild animals,** C. Elton (*Jour. Hyg. [London], 31 (1931), No. 4, pp. 435–456*).—The author finds outbreaks of epidemic disease to be common in populations of wild animals, including species little influenced by contact with the diseases of human beings or domestic animals. "Such epidemics form one of the commonest factors responsible for fluctuations in numbers of wild animals. An attempt is made to summarize the available published records of such epidemics . . . , while certain unpublished records (communicated to me by naturalists) are contained in an appendix. Little is known of the causes of these epidemics except in the cases of plague and tularemia. The fluctuations in numbers of some wild mammal populations are sufficiently regular to make the forecasting of epidemics possible. This method is already applicable to wild mice. Mouse periodicities are discussed in detail, with special reference to epidemics and their causes, which are mainly obscure. . . . Development of the forecasting methods described will make possible the prediction of many other wild mammal epidemics, and render intensive pathological and epidemiological studies more practicable than they have hitherto been."

**Experiments on the susceptibility of the domestic animal carriers of Rhipicephalus sanguineus to exanthematous fever** [trans. title], G. BLANC and J. CAMINOPÉTROS (*Compt. Rend. Acad. Sci.* [*Paris*], *193* (*1931*), *No. 4, pp. 258, 259*).—In attempting inoculation of the dog, rabbit, gray rat, hog, sheep, and pigeon, the authors have found that the animal carriers of the brown dog tick with which man habitually comes in contact apparently do not react and are not susceptible to the virus of exanthematous fever. The results indicate that, in the Mediterranean region at least, the virus is conserved in the brown dog tick and passes from one generation of this tick to another without a domestic animal serving as a reservoir. See also a note by Joyeux and Pieri (E. S. R., 65, p. 872).

**Epidemiological studies on foot-and-mouth disease**, J. FORSSMAN (*Acta Path. et Microbiol. Scand.*, *8* (*1931*), *No. 4, pp. 385–414, pl. 1, fig. 1*).—Observations made during extensive outbreaks of foot-and-mouth disease in Sweden in 1924 to 1927. respectively, led to the conclusion that chronic virus carriers with an infection period of more than from 2 to 3 months do not play any part in the spread of the disease. This is also true of virus carriers, provided they are given the same care, with currying, cutting, and treating the hoofs, as in Sweden.

**Fourth progress report of the Foot-and-Mouth Disease Research Committee**, J. A. ARKWRIGHT ET AL. (*London: Min. Agr. and Fisheries, 1931, pp. 375, pls. 12, figs. 23*).—In this fourth progress report (E. S. R., 60, p. 268) the research work (pp. 8–32) is taken up under the headings of the virus; culture of the virus; conditions of oxidation and reduction which favor survival of virus; survival in sewage and disinfection by ammoniacal liquids; survival of virus outside the animal body; dried milk; disinfection; chemotherapy; distribution and survival of virus in the bodies of animals after death; resistance to pickling of the carcass; effect on the infectivity of carcasses of storage at different temperatures; types of virus—virulence and adaptation of virus; the infectivity of living animals; sources of infection; the duration of infectivity; foot-and-mouth disease in other animals besides cattle, pigs, sheep, and goats; foot-and-mouth disease and vaccinia in calves, etc.; immunity; and the origin of fresh outbreaks of foot-and-mouth disease.

The details of the work and a bibliography are presented in five appendixes, respectively, as follows: Detailed Report of the Work Done at the Ministry's Veterinary Laboratory, New Haw, Weybridge, and at the Experimental Station, Pirbright, by W. H. Andrews, N. Dobson, T. Bannatyne, G. O. Davies, G. B. Simmins, C. V. Watkins, and J. T. Evans (pp. 33–140); Detailed Report of Work at the Lister Institute of Preventive Medicine, London, Part I, by J. T. Edwards, A. Ciuca, and Y. M. Gibbs (pp. 141–179), Part II, by J. T. Edwards (pp. 180–209); Detailed Report of Work at the National Institute for Medical Research, Hampstead, by I. A. Galloway (pp. 210–344); Detailed Report of Work at the Department of Bacteriology and Preventive Medicine, the University, Manchester, by M. C. and H. B. Maitland (pp. 345–359); and Bibliography of Foot-and-Mouth Disease (pp. 360–375).

**Experimental transmission of kala azar by the brown dog tick (Rhipicephalus sanguineus)** [trans. title], G. BLANC and J. CAMINOPÉTROS (*Compt. Rend. Soc. Biol.* [*Paris*], *107* (*1931*), *No. 26, pp. 1493–1495*).—In further studies (E. S. R., 65, p. 553) the authors have found that larvae and nymphs of the brown dog tick engorging on animals suffering from kala azar may become infected and remain so for at least 21 days. In the spermophile (*Citellus citellus*), experimentally infected by ticks, the development of the virus may require from 7 to 8 months, or much longer than when inoculated with the tissue of an infected spermophile. It appears that this tick acts as a real intermediate host rather than a simple mechanical vector of the virus.

**The resistance of rats to infection with Trypanosoma lewisi as affected by splenectomy,** W. H. Taliaferro, P. R. Cannon, and S. Goodloe (*Amer. Jour. Hyg., 14 (1931), No. 1, pp. 1–37, figs. 3*).—The authors find that splenectomy does not markedly influence the formation of the reproduction-inhibiting antibody against *T. lewisi* in young healthy Bartonella-free rats when the operation is performed at intervals from 7 days prior to infection to 41 days after infection.

A list is given of 26 references to the literature.

**Johne's disease on the east coast of Sumatra** [trans. title], H. Burggraaf (*Nederland. Indische Bl. Diergeneesk., 43 (1931), No. 4, pp. 359–362; Ger., Eng., abs., p. 362*).—The author reports that Johne's disease often runs a more acute course among estate cattle on the east coast of Sumatra than occurs in Europe, or from one to four weeks.

**An enzootic of infectious abortion of swine in Denmark** [trans. title], A. Thomsen (*Rev. Gén. Méd. Vét., 40 (1931), No. 476, pp. 457–466, figs. 2*).—An account is given of an outbreak of infectious abortion in swine in Denmark, involving 150 herds, which appeared in central Jutland and spread into Zealand through the sale of affected animals.

**Pig anaemia,** L. P. Doyle (*Vet. Jour., 87 (1931), No. 675, pp. 430–432*).—In this further contribution from the Indiana Experiment Station (E. S. R., 58, p. 280), attention is called to the beneficial effect of allowing the pigs to range over bluegrass pasture while the sows are kept confined in small outside pens. Pigs which were separated from their mothers for from three to five hours daily and placed on bluegrass sod inside of a central hog house escaped anemia, while their litter mates which did not have access to sod developed a severe form of the disease. Pigs which were placed on soil free from sod did not fare as well as those placed on sod, but much better than the ones which did not have access to either sod or soil. The feeding of green feed (green rye, green alfalfa, and green oats) to sows and pigs which were kept inside in concrete pens failed to show any well-defined preventive effect on anemia in the pigs. In this experiment the feeding of green feed (soiling) was begun at the beginning of the period of gestation, and was continued until the pigs were four weeks of age.

The results of preliminary experiments in which bluegrass sod was fed to sows kept inside during pregnancy suggest that the feeding of sod, with limited amounts of a suitable ration, may have a preventive effect on anemia in the pigs, even when the use of the sod is discontinued at farrowing time.

Sunlight did not appear to be of much direct importance.

**Concerning the life history of lungworms of swine,** B. Schwartz and J. E. Alicata (*Jour. Parasitol., 18 (1931), No. 1, pp. 21–27, pl. 1*).—The authors summarize the essential steps in the development of the lungworms *Metastrongylus elongatus* and *Choerostrongylus pudendotectus*, for which earthworms (*Helodrilus foetidus*) serve as intermediate hosts.

**Arduenna strongylina (Rudolphi 1819),** H. J. Smit and R. Notosoediro (*Nederland. Indische Bl. Diergeneesk., 43 (1931), No. 4, pp. 323–327, fig. 1; Ger., Eng., abs., pp. 326, 327*).—A description is given of this nematode, which was found in the stomach contents of a four-months-old pig in the Dutch East Indies.

**A note on the occurrence of eyeworms in dogs in the United States,** E. W. Price (*North Amer. Vet., 12 (1931), No. 11, pp. 49–58, figs. 4*).—This account includes a key to the species of the genus Thelazia, by means of which *T. californiensis* can be differentiated from other species.

**The egg production of two physiological strains of the dog hookworm, Ancylostoma caninum,** O. R. McCoy (*Amer. Jour. Hyg., 14 (1931), No. 1, pp. 194–202, fig. 1*).—The author found that the egg production of a cat strain of *A. caninum* in cats was approximately 2,350 eggs per day per female, as compared with the normal egg production of 16,000 eggs per day per female by a dog strain of *A. caninum* in dogs. The dog strain when introduced into cats produced an average of only 2,340 eggs per day, approximately the same number as did the cat strain, but the infections were of shorter duration than those of the cat strain. When infections of the cat strain were established in dogs, the egg production averaged 11,600 eggs per day per female. Apparently egg production is controlled by the host and is not inherent in the strain of worms.

**Critical experiments with the intra-cecal method of injection for the treatment of whipworms in dogs,** P. C. Underwood, W. H. Wright, and J. Bozicevich (*North Amer. Vet., 12 (1931), No. 10, pp. 41–47*).—The authors found injection, with or without preliminary colonic lavage, of varying doses of tetrachlorethylene, oil of chenopodium, or ethylidene chloride, through a flexible rubber catheter passed with moderate pressure for varying distances into the colon of dogs, to be 100 per cent effective for the removal of whipworms from 1 dog, 3.1 per cent effective in a second dog, and entirely ineffective in 11 other dogs. Some of these animals received more than one treatment.

**A bacteriological study of infectious laryngotracheitis of chickens,** J. R. Beach (*Jour. Expt. Med., 54 (1931), No. 6, pp. 801–808*).—In studies conducted in the department of animal pathology of the Rockefeller Institute for Medical Research, the causative agent of infectious laryngotracheitis of chickens was found to be present in bacteriologically sterile tracheal exudate, spleens, and livers of diseased fowls (E. S. R., 64, p. 564). It "was present regularly in the tracheal exudate, in the spleens of about 60 per cent, and in the livers of about 30 per cent of chickens with active laryngotracheitis infection. Suspensions of the spleen and liver were less effective in inducing the disease than those made from the tracheal exudate. This finding, together with the absence of pathological changes in the spleens and livers, would seem to indicate that they are not actively involved but that the causative agent is carried to them by way of the blood. The disease could, in our experience, be produced only in chickens. Domesticated ducks and several wild and free-flying species of birds, including sparrows, crows, starlings, doves, and pigeons, were found to be refractory, and so too were rabbits, guinea pigs, white rats, and one pig that was tested."

**A filtrable virus, the cause of infectious laryngotracheitis of chickens,** J. R. Beach (*Jour. Expt. Med., 54 (1931), No. 6, pp. 809–816*).—In studies conducted in connection with those above noted, it is shown "that tracheal exudate from two strains of laryngotracheitis of chickens from New Jersey and two from California when suspended in bouillon and passed through Berkefeld V filters will produce the disease. Two of six Berkefeld N filters allowed the etiological agent to pass, whereas four did not. Attempts to produce the disease with Seitz filtrates were unsuccessful. These results demonstrate that laryngotracheitis is caused by a filtrable virus that because of its size or some other property does not pass readily through the finer filters.

"It has been shown that the sera from fowls that have recovered from an infection with one of the New Jersey viruses will neutralize the same strain and also the one California strain tested. In order to demonstrate neutralization conclusively it was necessary to titrate samples of dried virus and in the tests to use approximately ten infecting doses. The virus dried over calcium chloride for 10 days and then stored in the refrigerator for 60 days produced disease.

Kept over calcium chloride for a month it was still active, and when dried by Swift's method it remained alive for 5 months."

**Studies of infectious laryngotracheitis (infectious bronchitis) of chickens at the Rockefeller Institute for Medical Research, J. R. Beach** (*U. S. Egg and Poultry Mag., 37 (1931), No. 11, pp. 34–37, 72, figs. 2*).—This is a practical account relating to the studies noted above.

**Histopathology of infectious laryngotracheitis in chickens, O. Seifried** (*Jour. Expt. Med., 54 (1931), No. 6, pp. 817–826, pls. 3, fig. 1*).—This is a report of studies conducted by the department of animal pathology of the Rockefeller Institute for Medical Research, started January, 1930, and continued in close cooperation with the etiological and experimental work of Beach above noted.

"The characteristic lesions of infectious laryngotracheitis are ordinarily restricted to the respiratory tract and are most pronounced in the larynx and trachea. Sometimes the eyelids are affected. A certain percentage of the cases are associated with bronchitis and peribronchitis, pneumonic areas, and hemorrhages in the lung, while the involvement of the nasal passages, communicating sinuses, and eyes seems to be dependent upon the mode of infection and the course of the disease. The virus affects the epithelial cells primarily, but soon inflammation develops in the submucosa and underlying parts. Edema is often extremely pronounced in the submucosa. The destruction taking place at later stages is due to edema, cellular infiltration, and hemorrhages, and in some instances to secondarily invading bacteria. Characteristic intranuclear inclusions in the epithelial cells of the trachea are present in many cases. They bear a close resemblance to the inclusions occurring in herpes, varicella, virus III of rabbits, and submaxillary gland disease of guinea pigs."

**Quantitative studies on the administration of variable numbers of nematode eggs (Ascaridia lineata) to chickens, J. E. Ackert, G. L. Graham, L. O. Nolf, and D. A. Porter** (*Amer. Micros. Soc. Trans., 50 (1931), No. 3, pp. 206–214*).—In this contribution from the Kansas Experiment Station an account is given of the results of feeding variable numbers of eggs of the nematode *A. lineata* to 628 chickens.

It was found that "doses of 100 or of 50 eggs of *A. lineata* ordinarily produce in young chickens infestations suitable for comparing the resistance of the hosts. No marked differences in sizes of infestations resulted from feeding doses of 500 eggs, 300 eggs, or of 100 eggs. These results are attributed to fluctuations in hatching rate of the eggs and to variations in the rate and vigor of the peristaltic movements of the fowls' intestines. The percentage of survival of larvae from the groups of chickens increased as the egg dose decreased in size, but not in an inverse proportion. Feeding doses of 25 and 50 eggs was more conducive to the growth of the young *A. lineata* than was the administration of doses of 300 or of 500 eggs. The decrease of percentage of survival and of growth rate of the young *A. lineata* resulting from the feeding of larger egg doses are thought to be due to a serological inhibiting factor. More resistance to the viability and growth of *A. lineata* was shown by groups of chickens 10 weeks old than by groups 7 and 6 weeks of age."

**Cestodes from the eastern wild turkey, O. L. Williams** (*Jour. Parasitol., 18 (1931), No. 1, pp. 14–20, figs. 2*).—Under the names *Davainea ransomi* and *D. fuhrmanni* the author describes two new species obtained from the eastern wild turkey. These tapeworms are considered to be of particular interest because of the close relationship existing between the eastern wild turkey and the domestic turkey.

**Species differentiation of the coccidia of the domestic rabbit based on a study of the oocysts, J. F. Kessel and H. A. Jankiewicz** (*Amer. Jour. Hyg., 14 (1931), No. 2, pp. 304–324, figs. 16*).—Studies of the oocyst stages of the

Eimeria of the domestic rabbit led the authors to differentiate five species, namely, *E. stiedae*, *E. perforans*, *E. magna*, *E. media* n. sp., and *E. irresidua* n. sp.

"Differential diagnosis in the living rabbit between liver and intestinal infections of coccidia is now possible by microscopic examination of the feces. Oocysts of *E. stiedae* in the feces point to a liver infection, whereas oocysts of *E. perforans*, *E. media*, *E. magna*, or *E. irresidua* denote intestinal infections. Animal transfer experiments, in which chicks and guinea pigs were fed the oocysts of the Eimeria of domestic rabbits, were attempted with negative results. The validity of 'nasal coccidiosis' as a disease is doubted."

**A Microfilaria from the blood of a wild rabbit,** B. Schwartz and J. E. Alicata *(Jour. Wash. Acad. Sci., 21 (1931), No. 13, pp. 298–301, fig. 1).*—A description is given of a species of Microfilaria taken from the blood of *Lepus washingtonii* by C. M. Hamilton of the Western Washington Experiment Station. The blood was that of a rabbit which succumbed after having been found in a stupor at Arlington, Wash.

**Skin reactions in rabbits infected with the larval form of Taenia serrata,** D. R. A. Wharton *(Amer. Jour. Hyg., 14 (1931), No. 2, pp. 477–483).*—The author finds the larval form of *T. serrata* to have a special predilection for the omentum of the rabbit, where it produces little effect on the host. "It may also encyst in the liver. The young larvae in their passage through the liver are particularly dangerous, since they may cause mechanical obstruction or injury of the ducts and vessels or pollution of the blood stream with their products of metabolism. Of 182 stock rabbits examined, 81, or 44 per cent, were found to be naturally infected.

"Skin tests were performed on 30 rabbits. The material used for testing consisted of 0.1 cc. of the supernatant fluid from a 1 per cent extract of the powder of various worms in saline after incubation at 37° C. for 0.5 hour and at room temperature for 15 minutes. Of 18 rabbits either naturally or experimentally infected with the larval form of *T. serrata* but with no other worm, 13 elicited positive and 5 negative reactions to the larval form of the specific antigen, and 15 positive and 3 negative reactions to the adult form. Two of the three negative reactions were elicited in rabbits so heavily infected that they may have been desensitized. Failure to react to either the larval or adult form of the specific antigen was observed in only 1 infected rabbit, which contained a single young larva in the liver. When several of these rabbits were tested with Moniezia, *Cysticercus fascioloris*, and Macracanthorhynchus, they exhibited uniformly negative tests. Uniformly negative tests were obtained with these antigens and the specific antigens in 12 uninfected rabbits."

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations at the New York Cornell Station]** *(New York Cornell Sta. Rpt. 1931, pp. 13–15).*—The results of investigations on the heating and ventilation of animal shelters and insulated concrete milk-cooling tanks are briefly presented.

In the ventilation studies it has been found possible to equip the ordinary farm barn with a homemade ventilation system at approximately 40 per cent of the cost of other natural draft systems. The poultry house ventilation studies indicate that the handling of the birds is the deciding factor so far as floor space per bird is concerned, and that for a 20 by 20 ft. pen 2.66 sq. ft. is the minimum to which the area per bird can be reduced.

The studies of sizes of insulated concrete milk-cooling tanks resulted in the selection of a ratio of water to milk of 3:1. A thickness of 3 in. of cork insulation was found to be the most desirable.

**Measuring water in irrigation channels,** R. L. PARSHALL (*U. S. Dept. Agr., Farmers' Bul. 1683 (1932), pp. II+18, figs. 7*).—This supersedes Farmers' Bulletin 813 (E. S. R., 37, p. 882). It presents information which is based on the results of studies conducted in cooperation with the Colorado Experiment Station. It describes different types of weirs and their use and gives tables of data for discharges under different conditions. The Parshall measuring flume also is described and illustrated, and tabular data given on dimensions and capacities for various crest lengths and for discharges under different conditions. It is stated that the Parshall measuring flume is more difficult to construct and install correctly than weirs, but it will measure water accurately in channels carrying silt or having comparatively slight fall.

**[Land-clearing investigations at the Alaska Stations]** (*Alaska Stas. Rpt. 1930, pp. 23, 24, fig. 1*).—The results of land-clearing experiments at Matanuska are presented in which several different types of tree stumps were removed by dynamite.

**Controlling small gullies by bluegrass sod,** R. E. UHLAND (*U. S. Dept. Agr. Leaflet 82 (1931), pp. 4, figs. 3*).—Practical information is given on the subject, supplementing that previously noted (E. S. R., 62, p. 78).

**Soil mechanics research,** G. GILBOY (*Amer. Soc. Civ. Engin. Proc., 57 (1931), No. 8, pp. 1165–1188, figs. 13*).—In a contribution from the Massachusetts Institute of Technology the salient features of the research conducted at that institutions in the field soil mechanics are summarized. The problems described fall into two main groups, namely, (1) soil physics, comprising studies of the composition and grain distribution of soils, permeability, compressibility, consolidation, compressive strength, internal friction, and cohesion; and (2) soil engineering, including investigations on the bearing capacity and settlement of foundations, on hydraulic-fill dams, and on the lateral pressure of earth against retaining walls.

The first group includes studies of the physical properties of soils and of the interrelation between these properties, with the ultimate object of understanding the nature of the effects observed in soils under various conditions. The second group comprises investigations of the behavior of soil as an engineering material forming part of a structure. It is pointed out that the two groups are closely interrelated, inasmuch as the knowledge of the behavior of a soil mass connotes a knowledge of the physical properties of its component parts.

In summarizing the work of others bearing on the subject, no mention is made of the comprehensive studies in progress at the Alabama Experiment Station for several years.

**Correlation of certain soil characteristics with pipe-line corrosion,** I. A. DENISON ([*U. S.*] *Bur. Standards Jour. Research, 7 (1931), No. 4, pp. 631–642, figs. 4*).—The results of investigations are reported which indicate that corrosion which has been experienced on a group of pipe lines in Ohio may be attributed to the corrosiveness of certain soils occurring along the lines. A satisfactory correlation was found to exist between the exchangeable hydrogen present in the soils and corrosiveness, as indicated by the quantity of pipe replaced.

In addition an accelerated laboratory test of soil corrosiveness involving the corrosion of a steel disk in contact with moist soil is described. The results obtained by this method paralleled the quantity of pipe replacements fairly closely in the case of heavy soils. The degree of corrosiveness indicated by the test is influenced by the acidity, texture, and probably by the structure of the soils studied.

**Public Roads, [December, 1931]** (*U. S. Dept. Agr., Public Roads, 12 (1931), No. 10, pp. 237–268+[2], figs. 29*).—This number of this periodical contains the current status of Federal-aid road construction as of November 30, 1931, and the following articles: The Effect of Materials and Methods of Placing on the Strength and Other Properties of Concrete Bridge Floor Slabs, by L. W. Teller and G. W. Davis (pp. 237–266); and Highway Research Board Holds Annual Meeting (pp. 267, 268).

**Materials and structures, Vol. I,** E. H. SALMON (*London and New York: Longmans, Green & Co., 1931, vol. 1, pp. X+638, pl. 1, figs. 395*).—This volume deals with the elasticity and strength of materials of construction. Part 1 considers elastic stresses and strains, while part 2 deals with the properties of materials of construction as determined by experiment.

**1931 Supplement to book of A. S. T. M. standards** (*Philadelphia: Amer. Soc. Testing Materials, 1931, pp. 144, figs. 15*).—This pamphlet comprises the first Supplement to the 1930 Book of A. S. T. M. Standards (E. S. R., 66, p. 79), and contains 32 standards adopted or revised on September 1, 1931.

**Experimental structural engineering,** H. W. COULTAS (*Struct. Engin., 8 (1930), No. 8, pp. 290–301, figs. 6; abs. in [Gr. Brit.] Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 10, p. 369*).—The author discusses the use of small-scale models for determining the relative displacements of portions of a structure as a basis for the calculation of bending moments, shear forces, and reactions without the labor of solving numerous and sometimes complex equations. A survey of accepted theories of stress analysis is followed by a numerical example illustrating the relation between analytical and mechanical methods of solution, and by an illustrated description of the principles, construction, and use of the Begg's deformeter.

**Elastic deformation of wooden rods under tensile stress** [trans. title], H. SIEGLERSCHMIDT and J. STAMER (*Ztschr. Ver. Deut. Ingen., 73 (1929), No. 46, pp. 1649, 1650, figs. 4; abs. in [Gr. Brit.] Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 1, pp. 21, 22*).—A brief account, accompanied by diagrams, is given of measurements of elongation and transverse contraction of wood. Six specimens (250 mm. (10 in.) long, 30 mm. diameter), i. e., 3 of pine, 2 of oak, and 1 of birch (compressed) were subjected to tensile stress (up to 28 kg. per square centimeter (398 lbs. per square inch)), and measurements were made tangentially and perpendicularly to the annual rings and in intermediate positions.

It was found that the elongation figures and moduli of elasticity were practically independent of direction of measurement. Hence, distribution of stress over the transverse section was uniform. The transverse contraction figures and the ratio of transverse contraction to elongation (reciprocal of Poisson's ratio) decreased from position 0 (tangential) to 90° (radial). In the birch specimen tensile stress caused expansion tangentially to the annual rings and contraction in a radial direction. It was found also that the values of the ratio of transverse contraction to elongation in no case exceeded 0.5 as the average for the directions between 0 and 90°, i. e., they remained within the limits found for metals. This would apparently indicate that wood becomes denser under tensile stress.

**Heat transfer through building walls,** M. S. VAN DUSEN and J. L. FINCK (*[U. S.] Bur. Standards Jour. Research, 6 (1931), No. 3, pp. 493–522, figs. 15*).—A method is described for measuring the heat transfer through large flat slabs, such as wall sections, under laboratory conditions, and the results of tests are given for a number of typical walls. The method requires no actual measurement of heat flow over large areas, but consists in comparing the thermal resistance of an unknown panel with a standard, the resistance of which can be accurately determined by the hot plate method.

The test results indicate in general that the presence of air spaces or pockets increases the insulating values of walls built of heavy clay products. Furring materially increases the insulating value of ordinary types of walls. It appears that the differences in insulating value between the various types of hollow tile walls tested are unimportant, and this applies also to different kinds of brick. The type of workmanship in a masonry wall may materially affect the insulating value, depending chiefly on the filling of the mortar joints. Solidly filled vertical joints are not so effective from the insulation standpoint as partially filled joints. It was found that the insulating values of all walls tested increased with decreasing temperature, the increase in general being more rapid with hollow walls than with solid walls.

**Notes on exploded wood for insulating and structural material,** R. M. Boehm (*Amer. Inst. Chem. Engin. Trans., 25 (1930), pp. 219–225, fig. 1*).—A brief description is given of this material and its uses.

**The deposition of dust on walls,** W. J. Hooper (*Physics, 1 (1931), No. 1, pp. 61–68, figs. 5*).—In a contribution from Battle Creek College, experimental proof is given of a thermal cause for the deposition of dust on plaster and lath walls wherein the course of the laths and rafters behind the plaster is outlined in dust. The thermal cause given is in agreement with the general theory of the behavior of small particles suspended in an atmosphere in which a temperature gradient exists. Experimental evidence is also produced to show that this phenomenon may be reduced to a negligible degree by thermal insulation.

**"Celotex," its manufacture and uses,** E. C. Lathrop (*Amer. Inst. Chem. Engin. Trans., 25 (1930), pp. 143–157*).—This paper describes briefly the methods of manufacture of Celotex, and discusses its main properties and uses.

**Drying of exterior paints under various weather conditions and over different woods,** F. C. Schmutz and F. C. Palmer (*Indus. and Engin. Chem., 22 (1930), No. 1, pp. 84–87, figs. 3; abs. in* [*Gt. Brit.*] *Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 1, pp. 23, 24*).—A laboratory study, conducted solely from the physical aspect, of the factors influencing the rate of drying and the subsequent durability of paint films is reported. A description is given of the apparatus and technic used to simulate various atmospheric conditions of temperature, humidity, and sunlight. Five typical house paints were used, covering a wide range in pigment and vehicle composition. These were applied to glass sheets, and the effects on drying time of thickness of film, humidity, light, and temperature were determined.

The results obtained indicate that excessive humidity and low temperature contribute to delay in drying and to resultant weakness in paint film. Similar tests were carried out with paint films applied to wood disks, and it was found that the harmful effects of high humidities and low temperatures are intensified when poor quality woods are used.

**Properties of wood that determine paint service of exterior coatings,** F. L. Browne (*Paint, Oil, and Chem. Rev., 89 (1930), No. 12, pp. 9–13, figs. 3*).—In a contribution from the U. S. D. A. Forest Products Laboratory the author discusses the physical properties, microscopic structure, and chemical composition of wood in their bearing on the durability of paint coatings under normal conditions of exposure.

Charts are given showing the relative durabilities of paints as affected by wood species, density, grain direction, quality, climate, and paint composition. These demonstrate extreme variability in paint behavior, and point to the necessity for further research in this field with a view to improving both paints and painting technic.

**Absorption of ultra-violet light by lacquer films,** D. C. DUNCAN, D. R. WIGGAM, and W. P. DAVEY (*Indus. and Engin. Chem., 23 (1931), No. 8, pp. 904–906, figs. 3*).—Studies conducted at the Pennsylvania State College are reported which showed that within the ultra-violet range included in sunlight practically all the absorption of light energy by an ordinary lacquer is due to the ester gum. A considerable portion of this absorbed energy may reappear as fluorescent radiation, as electrons released photoelectrically from the gum, or as energy of collision of the second kind, in which the excited molecules in the gum transfer the absorbed energy directly to neighboring molecules in the nitrocellulose. The same effect is also present in the case of tricresyl phosphate and, to a smaller extent, in castor oil.

The nitrocellulose itself is sufficiently transparent to those radiations which have any considerable intensity in sunlight, so that it can be assumed that the failure of nitrocellulose in lacquer films is, for the most part, the result of secondary processes. This suggests that the light resistance of lacquers can be most easily improved by developing a nitrocellulose which is more resistant to electron bombardment, or by avoiding the use of fluorescent plasticizers and substituting some other gum suitable for lacquer purposes which is free from the objectionable absorption characteristics of ester gum.

**Applications of hydrogenation in oil refining,** M. W. BOYER (*Amer. Inst. Chem. Engin. Trans., 25 (1930), pp. 1–15, figs. 5*).—This paper briefly describes the development and research work underlying the hydrogenation process as applied to the petroleum industry, and discusses some of the major applications with particular reference to fuel and lubricants for internal combustion engines. It is pointed out that the process may accomplish an increase or a decrease in the paraffinic character of the products as desired. It is possible to make paraffinic kerosene or an antiknock gasoline by the alteration of operating conditions such as temperature and hydrogen concentration. Thus the process presents the possibility of altering the carbon-hydrogen ratio and influencing the molecular structure of various petroleum fractions, at the same time removing undesirable sulfur compounds.

**Electric motors for the farm,** F. J. ZINK (*Kans. Agr. Col. Ext. Bul. 69 (1931), pp. 23, figs. 15*).—Practical information is given on the adaptation of electric motors to different farm operations, including tabular data on motor sizes, styles, and types.

Important advantages of the electric motor are its adaptability to many machines and its large overload capacity. It has been found that a 0.25-h. p. motor will do as much work as a man at hard labor turning a crank. Two portable motor units, a 0.25- or 0.5- and a 5- or 7.5 h. p. motor will care for all the usual farm machines not provided with attached motors. An individual motor drive should be used for those machines which are operated frequently or are operated for considerable periods of time.

The line shaft drive is not recommended for electric motors. Pliable belts without heavy lacing give greater satisfaction for drives. Fuses are not generally adequate for the protection of a farm motor against injury through overheating. Suitable overload protection should be used with all motors.

An appendix is included which describes types of motors.

**Agricultural machines,** K. VORMFELDE (*Handbuch der Landwirtschaft. Band III, Pflanzenbaulehre. Landmaschinen. Berlin: Paul Parey, 1930, vol. 3, [Sup.], pp. 220, pls. 8, figs. [249]*).—This is a technical treatise on farm machinery, dealing with its development, design, testing, and proper adaptation. It covers practically every type of machine used in German agriculture, and is profusely illustrated from the standpoints of both technological development and practical use.

**The determination of animal work accomplishment in agriculture through power measurements and the results thereof,** G. LIPINSKI (*Landw. Vers. Sta., 112 (1931), No. 3-4, pp. 191-242, figs. 11*).—In a contribution from the University of Breslau several different types of draft dynamometers are described, and the results of draft measurements with three of them are reported of drills, fertilizer distributors, harrows, mowers, potato diggers, cultivators, plows, tractors, rollers, wagons, and choppers. A 1,000-kg. hydraulic draft dynamometer was found to be best adapted for tests of this character and to yield what appeared to be the best average results.

It was found that the horses of a 2-horse team will vary considerably in their draft output. On down-grade work the pull on tongue chains also is considerable, making brakes on implements used in hilly country necessary to conserve horse energy. The necessity for lubrication of machines also was emphasized in the draft results, it being found in one case that a wagon had four times the draft with ungreased axles as with greased axles.

The tests also revealed that the output in work of horses used in Germany is only average, and it is felt that a greater output can be obtained from them.

**Potato storage on 259 farms in New York,** A. L. WILSON and E. V. HARDENBURG (*New York Cornell Sta. Bul. 526 (1931), pp. 58, figs. 27*).—This bulletin presents the results of a survey made to determine the types of potato storages being used, their efficiency, and the extent of their use during the storage seasons of 1927–28 and 1928–29.

The survey covered a total of 259 farm storages. The survey records involve 144 house cellars, 44 barn basements, 54 bank storages, and 17 special structures situated in 20 New York counties. House cellars were found to constitute the most common type of farm storage and are generally distributed over the entire State. The average capacity varies from the smallest in house cellars to the largest in the special storages. The principal defect in existing storage structures appears to be lack of provision for the removal of excess moisture during a part of the storage period.

Temperature control is not a serious problem in most storages. The humidity was found to be the highest in bank storages and the lowest in house cellars. Shrinkage, which is assumed to be the best measure of storage efficiency. averaged 6.38 per cent for house cellars, 5.97 per cent for barn basements, 5.13 per cent for special storages, and 2.69 per cent for bank storages. It was found that shrinkage in the four types of storage is directly proportional to average temperature and inversely proportional to humidity.

The details of construction of walls, floors, ceilings, insulation, doors, windows, and ventilation and temperature control equipment are described and discussed for each of the four types of storage. Four of the bank storages studied are described, illustrated, and discussed in considerable detail, and plan and elevation drawings and drawings of certain structural details are presented, together with bills of material and estimated costs.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**[Investigations in agricultural economics and farm management at the New York Cornell Station, 1930–31]** (*New York Cornell Sta. Rpt. 1931, pp. 3–13*).—Results of investigations not previously noted are reported on as follows:

*Farm management surveys of northern Livingston County, New York, for the crop years 1908, 1918, and 1928,* S. W. Warren.—It was found that during the 20-year period the number of dairy cows per farm increased from 9.6 to 12, the amount of milk sold per farm increased more than 100 per cent, the amount of cream and butter sold decreased about two-thirds, the number of sheep on farms decreased 34 per cent, and the number of hogs and pigs decreased 67 per cent. The average amount of milk and milk equivalent sold per cow per farm increased from 3,756 to 5,385 lbs. Relatively large dairy herds were found to be more profitable than smaller herds in each of the three years studied. A relatively large proportion of the crop area in intensive crops was found profitable in 1908 and 1928. The study emphasizes the growing importance of high production per cow, high yields per acre, size of business, and type of farming.

*Farm management surveys of Tompkins County for the crop years 1907, 1917, and 1927,* E. G. Misner.—Six townships included in the study previously noted (E. S. R., 25, p. 594) were resurveyed in 1927. Data are included regarding the capital invested per farm and the labor income of farm operators deriving no income from work off the farm and of those deriving considerable income from such source, and some comparisons are made with the 1907 results.

*An economic study of the grape industry in eastern United States,* G. P. Scoville.—Some of the findings of the study begun in 1929 in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the Colleges of Agriculture of Pennsylvania, Arkansas, and Michigan are given. The average cost of growing, harvesting, and marketing grapes was $54 per ton and the average amount received by growers $39 per ton. The grape enterprise on the 548 farms studied in the several States paid all costs except labor, and 16 cts. per hour for labor which cost 39 cts. per hour. On an average an increase of 0.5 ton per acre in yield increased the returns per hour of labor about 9 cts. One of the most important factors in determining yield was the natural productiveness and drainage of the soil. Efficient size of business was an important factor in reducing costs per ton, it being found in Pennsylvania that 34 hours more of labor per acre were required on vineyards averaging 11 acres than on those averaging 40 acres. The returns per hour of labor for growers selling 50 per cent or more of their grapes to grape juice plants averaged 8 cts., for those shipping 50 per cent or more by rail 17 cts., and for those selling 50 per cent or more by truck 29 cts. Those doing their own trucking received an average of 41 cts.

*The marketing of eastern grapes: A study of retail and consumer demand in Philadelphia, Cincinnati, and Chicago,* M. P. Rasmussen.—The study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the Federal Farm Board, showed that eastern grapes are not available in containers small enough to suit consumer needs, due to the assumption of producers that practically all eastern grapes purchased in the fresh state are converted into juice. Approximately two-thirds of such grapes are used for table and jelly purposes, and only about 38 per cent for juice. Greater attention to the packing and wider distribution in 2- or 4-qt. baskets for table and jelly purposes, it is believed, would result in appreciable gains in demand. Chain and independent grocery stores were found to be handling relatively insignificant quantities of eastern grapes. Both retailers and consumers seemed satisfied with the quality of eastern grapes, but slack packing was a serious drawback.

*A statistical study of apple shipments from western New York,* L. Spencer.—Some findings are included regarding the percentage of shipments going to different United States destinations and exported, the destinations by varieties, and the differences in prices for the same variety in different cities. This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

*The agricultural situation*, G. F. Warren and F. A. Pearson.—An analysis of the relation of gold stocks and wholesale prices, 1830–1930, indicated that with an annual increase of 3.1 per cent in the quantity of gold, prices are relatively stable, with more rapid increases prices rise, and with less rapid increases prices fall. During approximately the last 15 years the world's stocks of gold have increased less rapidly than 3.1 per cent, and during most of this period declining prices have been experienced.

A study covering a long period of years indicated that the purchasing power of wages has increased about 2 per cent per year. There was a slight decline in wages in England after the Napoleonic wars and in the United States after the Civil War, but in neither case was the decline more than 15 per cent.

The production of all commodities in the United States at the present time was found to be probably lower, as compared with normal, than at any previous time in history. A serious overproduction of sheep and cattle was found at the present time. The cycles in these cases are independent of the general business situation, being dependent on the length of life of the animals.

The slowness of the adjustment of city real estate to lower commodity prices is set out as one of the serious problems of the present business situation. Attention is called to the change in the investment policy of life insurance companies—the shifting from farm mortgages to other forms of investment.

*World production and prices of Merino and crossbred wool*, H. M. Stoker.—Decided cyclical fluctuations were found in all the principal wool-producing areas of the world in the number of sheep and in the production of wool. United States production of Merino wool was found to be more variable than that of crossbred wool. The peaks in Merino-wool production alternated with those in crossbred-wool production. This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the Institute of Economics, Washington, D. C.

*Land classification*, F. F. Hill and A. B. Lewis.—A map, showing the use made of each 10 acres of land in Tompkins County, was prepared and the land classified into 5 classes. In 3 townships nearly 18,000 acres were classed for reforestation at once. Based on the probable land uses, a map was prepared showing the roads necessary to serve adequately land now farmed and likely to continue so.

**[Economic investigations at the Ohio Station]** (*Ohio Sta. Bimo. Bul. 154 (1932), pp. 26–31*).—Results in agricultural economics are given.

*Marketing cannery tomatoes in Ohio*, C. W. Hauck (pp. 26–28).—Five canners operating seven factories bought canning tomatoes on U. S. grades for the first time in 1930, paying from $13 to $18 per ton for No. 1's, $9 to $12 per ton for No. 2's, and nothing for culls. Most other Ohio canners paid flat rates of from $10 to $12 per ton. Approximately 9,000 tons of tomatoes were received by the factories buying on grade, and the average price paid was $12.59 per ton. Analysis of the price received by 10 growers under the grade plan showed a range in the average price received by the several growers of from $6.46 to $17.52 per ton.

*Farm housing in Ohio*, C. E. Lively (pp. 28, 29).—The results of a number of studies of rural housing conditions in Ohio are briefly summarized.

*Ohio farms grow larger*, J. I. Falconer (p. 30).—A table is given and discussed showing the number of Ohio farms of different sizes in 1910, 1920, and 1930 and the percentage of each group of the total number of farms.

*Index numbers of production, prices, and income*, J. I. Falconer (p. 31).—The table previously noted (E. S. R., 66, p. 477) is brought down through October, 1931.

**[Investigations in agricultural economics at the South Carolina Station, 1930–31]** (*South Carolina Sta. Rpt. 1931, pp. 12, 13, 116, 117, figs. 2*).—Results not previously noted are reported on as follows:

[*Farm organization and management in the Orangeburg area*], W. C. Jensen, B. A. Russell, and C. Gunnells.—Farm management records were secured from 80 farms in 1928 and in 1930. Operator's earnings in 1928 averaged $897, varying from less than nothing for the poorest 25 per cent of the farms to $2,821 for the best 25 per cent. The best farmers had an average of 180 acres in crops with an average yield of 275 lbs. of cotton per acre, as compared with 140 acres and 209 lbs. for all the farms. The hog enterprise was an important source of cash receipts on a number of the farms.

*The power unit as a factor in production costs of corn and cotton*, C. S. Patrick.—Thirty-four acres of cotton and 40 acres of corn were divided into 4 plats each and prepared, planted, and cultivated, using the following power units: With one animal, with two or more animals, with tractor, and with the unit which at the time of the operation seemed most desirable. Tables are given showing the production cost per acre, by items, and the yield per acre on the several plats.

**Studies in taxation receipts and expenditures of county governments in Delaware**, M. M. Daugherty (*Delaware Sta. Bul. 173* (*1931*), *pp. 59, figs. 35*).—Tables and charts, together with brief explanatory text, are included showing by years 1922–1930 for each of the three counties of the State (1) the cost and percentage distribution of costs of county governments, classified as follows: General government, elections, protection to person and property, hospitals, charities, and corrections, conservation of health and sanitation, development and conservation of natural resources, miscellaneous expenditures, and debt services; (2) the expenditures under the several functions by classes and subclasses; and (3) the net receipts classified by sources.

No attempt is made to draw any conclusions or make any recommendations.

**Reading references for the study of taxation**, G. S. Klemmedson (*Colorado Sta. Bul. 382* (*1931*), *pp. 26*).—This is a selected annotated list of references classified under the following headings: General, property taxes, income taxes, business and corporation taxes, inheritance and estate taxes, sales taxes, gasoline and highway taxes, miscellaneous taxes, taxation and education, administration of tax system, special tax reports—other States, organization and administration of State government, county government, taxpayers' associations, public expenditures, and Colorado tax problems.

**The Missouri farm real estate situation for 1927–1930**, C. H. Hammar (*Missouri Sta. Research Bul. 154* (*1931*), *pp. 81, figs. 13*).—The condition of agriculture in the United States and the world as it relates to the values of farm lands is described. The movements of farm real estate values in Missouri as compared with the United States and certain other States, prices and purchasing power of farm products, and the number of transfers and the acreage involved in Missouri are discussed.

A record of the transactions in farm real estate in which the sales price was noted directly on the deed was obtained for each year, 1927–1930, in 13 counties from the records of the recorder of deeds. These data included at least one county in each type of farming area of the State, except the eastern truck crop and wheat area, which was omitted because of its suburban character. The changes in values in the several counties are analyzed and discussed from the points of view of type of farming and on the basis of soil types.

The trend of the value of Missouri farm real estate was upward prior to 1920. After 1920 the decline was rapid, until in 1930 values were only 89 per cent of those in 1914 in terms of current dollars and only 66 per cent in terms of dollars of constant purchasing power.

The following table shows the indexes, 1928, 1929, and 1930, of the values of farm real estate (1927=100) for the several counties studied:

*Indexes (1927=100) of values of farm real estate, 1928–1930, in Missouri type of farming areas*

| Type of farming area and county | Year | | |
|---|---|---|---|
| | 1928 | 1929 | 1930 |
| | *Per cent* | *Per cent* | *Per cent* |
| Northern meat production: | | | |
| Atchison County | 98 | 93 | 100 |
| Harrison County | 77 | 88 | 68 |
| Sullivan County | 98 | 102 | 88 |
| Ralls and Callaway Counties | 67 | 67 | 55 |
| Johnson County | 100 | 89 | 72 |
| Ozark border (Franklin County) | 88 | 106 | 113 |
| Ozark meat production. | | | |
| Miller County | 88 | 84 | 96 |
| Reynolds County | 73 | 87 | 80 |
| Western corn and small grain (Barton County) | 89 | 86 | 73 |
| Ozark plateau dairy (Polk County) | 92 | 82 | 73 |
| Southwest fruit and dairy (Newton County) | 107 | 89 | 72 |
| Southeast lowlands (Pemiscot County) | 119 | 99 | 99 |
| State (13 counties) | 90 | 85 | 75 |
| State (weighted average) | 95 | 88 | 83 |

**Farm organization and management in Grayson County,** W. L. Rouse, H. W. Hawthorne, and Z. L. Galloway (*Kentucky Sta. Bul. 317 (1931), pp. 161–215, fig. 1*).—This study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, presents an analysis of the farm business and the sources and uses of incomes of 233 families for the year ended March 1, 1929. It deals chiefly with the 205 farms on which the operators secured 75 per cent or more of their total receipts from the operation of their farms. Cost-of-living records secured from 138 of the families are analyzed in more detail in the bulletin noted on page 683. A table is included giving for the 205 families and for those with operator's earnings of less than $500, from $500 to $990, and $1,000 and over the averages for acreage in farms; utilization of lands for different purposes; acreages in, yields of, and receipts from different crops; numbers of and receipts from different kinds of livestock; capital investment by the chief items; expenses for different purposes; depreciation and decreases in inventory; contribution of the farm to the family living; information as to labor utilization; farm and labor incomes; and operator's earnings. The relations of type of farming, size of farm, capital investment, crop yields, livestock production, efficiency of labor, and other items to income are discussed.

Suggested systems of farming are outlined for an 80-acre, a 150-acre, and a 200-acre farm, and estimated receipts and expenses for different products are given.

The operators of 133 of the 205 farms had earnings of less than $500, 56 had earnings of from $500 to $099, and 16 earnings of $1,000 or more. On an average, the most successful operators obtained larger crop yields, had livestock which was more productive, and used labor more efficiently. Volume of sales per acre, size of business, and labor accomplishment per man were important factors in increasing profits. Classifying the items according to whether they were above or below the following averages for the 205 farms—

acres in crops 44, acres in tobacco 0.5, number of cows 3.4, number of hens 85, receipts per cow $98, receipts per hen $2.39, crop acres per man 32.6, crop acres per horse 12.9, yield of corn 14 bu., and receipts per $1 expense $1.60—it was found that receipts, farm income, labor income, and operator's earnings increased from $210, —$60, —$157, and $63, respectively, for the 13 farms with no factor above the average to $727, $304, $114, and $411, respectively, for the 31 farms with 4 factors above the average, and to $2.146, $1,281, $871, and $1,322, respectively, for the 13 farms with 8 factors above the average. No farm had more than 8 factors above the average.

**Dairy plant efficiency studies** (*Vermont Sta. Bul. 332* (*1931*), *pp. 16, 17*).—Detailed operating costs of 6 cooperative creameries are summarized in this study. The average cost per 100 lbs. of milk handled was 50.78 cts. for creameries handling less than 6,000,000 lbs. per year, 34.17 cts. for those handling from 10,000,000 to 15,000,000 lbs., and 41.21 cts. for those handling up to 20,000,000 lbs. The average cost per 100 lbs. for handling shipped milk was 29.14 cts. for the small creameries and 23.27 cts. for the medium-sized creameries. For separating milk and handling the resultant cream, the average cost per 100 lbs. was 33.84 cts. when less than 2,000,000 lbs. of milk were separated, and 17.34 cts. when from 5,000,000 to 9,000,000 lbs. were separated. Butter cost 9.41 cts. per pound when less than 100,000 lbs. were made annually, and 6.72 cts. when up to 165,000 lbs. were made. Plain condensed skim milk cost on the average 1.235 cts. per pound. Cheddar cheese cost 9.33 cts. when only 25,000 lbs. were made, and 2.67 cts. when 427,000 lbs. were made during the year. Cooked curd casein cost 4.36 cts. and dried casein 4.8 cts. per pound to manufacture. Annual boiler costs averaged 4.99 cts. per 100 lbs. of milk handled, while the cost of testing ranged from 0.01 to 1.98 cts. per 100 lbs. of milk.

**A study of the organization and management of Rhode Island farms,** J. L. TENNANT (*Rhode Island Sta. Bul. 230* (*1931*), *pp. 56, figs. 9*).—This bulletin reports the results of a study based on farm business records obtained by personal interviews from 142 farms in 4 areas of the State in 1928 and from 124 farms in 5 areas in 1929. The types of farming in the several areas are described. Tables and charts are given and discussed showing the tenure of farmers, the average size of farms, cropped acreages, number of cows and hens, capital, receipts, expenses, farm and labor incomes, family use of farm products, the ranges of labor income, and the number of farmers having labor incomes of different amounts. Analysis is made of the average business per farm, by labor income groups, of the large wholesale dairy farms, small wholesale dairy farms, wholesale dairy farms having one or more minor enterprises, and farms on which poultry was an important enterprise. Suggestions are made regarding dairy farming and the management of poultry farms.

**Cattle production costs in Nevada in the years 1928, 1929, and 1930,** C. A. BRENNEN ET AL. (*Nevada Sta. Bul. 124* (*1931*), *pp. 54, figs. 31*).—This bulletin gives a general summary of the method used in obtaining ranch costs, presents the costs of important ranch accounts and of producing cattle, and discusses the main factors causing variations in costs. It is based on actual records of all the factors entering into the cost of producing beef cattle for the market kept on 20 representative ranches in 1928–1930. Tables and charts are included showing the costs for the various factors for each of the 20 ranches.

The average costs found for the several accounts considered were as follows: Automobile, $1.07 per gallon of gasoline consumed; board and lodging, $1.33 per day; pasture and grazing, $1.36 per head including young stock;

horse costs, 43 cts. per work day; handling cattle, $2.55 per cow unit; feeding cattle, $1.97 per cow unit, feeds for cattle, $8.45 per cow unit; and general ranch costs, $2.29 per cow unit. The average net carrying cost per cow unit was $14.88. Bull cost per breeding cow was from $1.79 to $2.80 per calf branded. Death losses averaged 3.1 per cent of all cattle, and the average calf crop percentage was 63.92. The average cost of cow maintenance was $18.19. The average cattle production costs per head and per pound were: 6-months calf, $28.46 and 7.7 cts.; yearling, $34.04 and 6.6 cts.; 18 months, $40.82 and 5.96 cts.; 2 years old, $49.10 and 5.28 cts.; 30 months, $57.39 and 5.52 cts.; and 3 years old, $65.82 and 5.98 cts. In round numbers, with a $17 cow maintenance cost, 6-months-old calves could be produced for $7 per head less with an 82 per cent calf crop than with a 62 per cent crop. Calf crop has its greatest influence on initial cost of the calf, but the carrying cost is the most important factor affecting the production cost of cattle older than yearlings.

**The relation of quality of cotton to prices paid to farmers in Alabama,** J. D. Pope and C. M. Clark (*Alabama Sta. Bul. 235 (1931), pp. 48, figs. 5*).—This study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics. Comparison is made of the grades, staple lengths, and tenderability of cotton produced in Alabama, 1926–1930, and in the United States, 1928–1930. Samples of individual bales were obtained during 1926, 1927, and 1928 at towns or gins in different regions of the State and classified by Federal classers. So far as possible the date of sale and price paid to the farmer for each bale sampled were obtained. Buyers' grades were obtained at 4 towns in 1926 and 1 town in 1928. Information was obtained by interviews with farmers in 6 counties concerning the variety of cotton grown, yields, and other factors, and from gins regarding weights of seed, lint, and tare.

The data were analyzed with a view to determining the differences in prices paid to farmers for different grades and staples, the spreads between farm prices and central market prices, and the ranges from the lowest to the highest prices. The variations in prices for the same quality in the same local market and between local markets, the price differences for grades and staples in the local and central markets, and the ratio and frequency distribution of the differences are discussed, and also the differences in local buyers and government classification, the effect of selling in round lots, the spreads between farm and central market prices, and the economic aspects of varieties.

The grade of Alabama cotton from 1926 to 1930 compared favorably with that of the United States as a whole, but 36 per cent of Alabama cotton from 1928 to 1930 had a staple length shorter than ⅞ in. as compared with 16 per cent for the United States. There was a definite tendency for buyers in Alabama to pay farmers more for the better grades than for the poorer grades. Little distinction, if any, was made in 1926–1928 in the price paid farmers for $\frac{13}{16}$-in. and shorter, ⅞-in., and $\frac{15}{16}$-in. staple. Prices paid in the same town for the same grades and same staples on the same day showed wide variations. The same was true between towns. Farmers received $1 per bale more for sales in round lots than for single bales. Improvement of classification in local markets is a fundamental consideration in the problem of paying farmers for cotton in accordance with quality. The economic reward for high yields per acre was found to be a more important factor influencing the variety of cotton grown than the reward for staple length. Recognition of staple length differences in individual bales through premiums and discounts is necessary before farmers will grow varieties on the basis of staple length instead of only on the basis of yield of lint per acre and gin turnout.

**Some factors affecting the price of white burley tobacco,** D. G. Card (*Kentucky Sta. Bul. 323 (1931), pp. 419–437, figs. 7*).—The changes from 1912 to 1930 in production, acreage, yield per acre, and consumption of white burley tobacco are discussed. The yearly fluctuations in production, trends in prices, growers' response to price, and the relation of size of crop to total value are analyzed.

Acreage, total production, price per pound, and consumption of burley tobacco have definitely increased during the period, but average yield has decreased. Wide fluctuations in production have occurred, usually accompanied by opposite changes in price. Gross value of total production has tended to be large with large crops and small with small crops. The increase in consumption has not kept pace with the increase in cigarette production. About three-fourths of the changes in production are due to changes in acreage and one-fourth to changes in yield. Acreage planted was found to be determined largely by prices for tobacco during the two preceding years. It is indicated that the future production of burley tobacco is exceptionally subject to the control of price-making factors or to the concerted action of growers.

**Consumer preferences for potatoes,** E. H. Rinear (*New Hampshire Sta. Circ. 37* (*1931*), *pp. 14*).—This study is based on a house-to-house canvass in 1929 of 1,052 homes in 6 cities of the State. The canvassers exhibited 11 typical Green Mountain potatoes of different sizes and weights to those interviewed. Data were secured as to the preferences as to size, qualities desired, consumption, storage and sources of supply, and preferences for New Hampshire or Maine potatoes. Nationality of the consumer and three income groups—under $1,500, from $1,500 to $2,500, and above $2,500—are considered in analyzing the data.

The study showed that consumers are not satisfied with a large part of the potatoes purchased, and that growers need to revise many of their growing, handling, and grading practices.

**Organization and management problems of cooperative strawberry marketing associations in Kentucky,** C. D. Phillips and D. G. Card (*Kentucky Sta. Bul. 319* (*1931*), *pp. 247–287, figs. 4*).—This bulletin is based on a study of 10 Kentucky associations and 1 located near by in Tennessee. A table is included showing the high, low, and average expenses per car, by items, for the associations. A chart shows the costs for the individual associations. The reasons for the variations in costs are discussed, and suggestions are made as to possible means of reducing items. Handling side lines, meeting market requirements, inspection, handling surplus berries, distribution of shipments, market information, selling practices, pooling, and cooperation among the cooperative associations are also discussed.

The total costs per car in 1929 ranged from $23.65 to $128.58, averaging $52. Increase in volume handled per season up to 100 to 150 cars was found to be accompanied by lower unit costs.

**The standard of living of farm families in Grayson County, Kentucky,** M. Oyler (*Kentucky Sta. Bul. 316* (*1931*), *pp. 127–159*).—This bulletin analyzes in detail the cost-of-living records secured in the study noted on page 680. A table is included showing the average amounts expended for different types of expenditures and the value of goods furnished by the farms. Other tables show the percentage distribution to the different types of expenditures in the groups of families expending less than $600, from $600 to $899, from $900 to $1,199, and $1,200 and over. The different items of expenditures are discussed, and tables are given showing the value of food per adult male unit in the total value of family living groups and the value of clothing per person in different age and sex groups. Comparisons are made with the costs of living found in Laurel County, Ky. (E. S. R., 64, p. 90), and for 2,886 families in selected localities in 11 States (E. S. R., 56, p. 185).

The place of birth, age, and schooling of the operators and home makers; the number, age, schooling, etc., of the children; the participation of the families in church, lodge, and other activities; and the ownership of automobiles are discussed.

The average value of living for the 138 families was $736, of which 46.7 per cent was furnished by the farm. The average value for 57 families was $460, and for 9 families $1,497. The average values for different kinds of expenditures were for food $333, of which $244 worth was furnished by the farm; clothing, $140; rent furnished by the farm, $72; furnishings and equipment, $15; operation goods, $69, of which $28 was furnished by the farm; maintenance of health, $24; advancement goods, $51; personal goods, $18; life and health insurance, $12; and unclassified expenditures, $2.

**Some social and economic aspects of the problem of rural health in Oklahoma,** O. D. Duncan (*Oklahoma Sta. Circ. 78* (*1931*), *pp. 19, figs. 2*).—Tables are included and discussed showing the expenditures in 1925 for medicines, for dental work, and for doctor and hospital services of 740 Oklahoma farm families grouped according to the average number of years of schooling of the husbands and wives; the preventable deaths from the principal communicable diseases in the State in 1929 and the estimated monetary loss to the State; the percentage distribution of family expenditures of 1,329 Oklahoma farm families grouped by tenure status; comparative health cost per family in Oklahoma and other States; the infant and maternal mortality rates for Oklahoma, 1920–1929; comparison of the infant mortality, by years 1920–1929, in certain urban and rural areas of the State; and the number of deaths in 1920 and 1929 from specific causes (noncommunicable).

**Rural community trends,** H. J. Burt (*Missouri Sta. Research Bul. 161* (*1931*), *pp. 48, figs. 6*).—This report describes a plan for making a continuous annual measurement of rural community status and trends, and reports and discusses the first year's work done using the plan. The areas involved were three consolidated high school districts in the west-central part of the State, and the community interests measured were public schools, health, utilities and public services, finance, wealth and trade, and civic and religious interests. An index number was developed to measure each interest, and the five interest indexes were combined into a community index number. The components used in the several indexes and the method of rating each are discussed. The methods used in obtaining local cooperation in the work of collecting the data, in presenting the findings to the communities, and providing for continuation of the work through local cooperation are described.

An appendix includes exhibits of the forms used in the study.

**Rural community clubs in North Dakota: Factors influencing their success or failure,** E. A. Willson (*North Dakota Sta. Bul. 251* (*1931*), *pp. 108, figs. 26*).—This bulletin presents the results of a state-wide study of community clubs, their characteristics, activities, difficulties, and stability in terms of mortality over the period 1926–1929. The data were obtained by use of questionnaires in 1926, 1927, and 1929. Detailed case studies were also made in 8 areas and restricted studies in several other areas. In 1926 usable questionnaires were received from 98 active clubs. In 1929 information was obtained from 47 of these clubs, of which 23 were active, 14 not functioning, and 10 had been reorganized into types of clubs not classified as community clubs. In 1929 data were also secured from 37 additional clubs, of which 22 were active, 10 inactive, and 5 had been reorganized. The influence of county agents, imitation, length of settlement, density of population, permanency of tenure of farmers, size of farms, foreign birth and nationality of farmers, tenancy, and type of farming on the distribution of clubs is analyzed. The objectives of organization, age of clubs, type of membership, club headquarters, frequency of meetings, financial support, nationality of membership, and the function or activities of clubs as factors affecting the stability of clubs are discussed. The causes of failure of clubs; difficulties of clubs and their relations to stability, number of activities, and ages of clubs; conflicting interests in clubs; and the factors making for success of clubs are also discussed.

The major factors influencing the distribution of community clubs in the State were found to be the extent of stimulation and direction from outside the community, the imitation of contiguous areas where clubs were functioning successfully, the degree of social solidarity in an area, and the nationality of the population. The chief factors requisite for a successful area type family rural social organization and making for stability or permanency of clubs were a relatively stable population; tolerance and respect for the attitudes, beliefs, customs, and interests of individuals and groups in the community; wise and unselfish leadership; diversified activities which will entertain and interest all groups, but which are not offensive to the beliefs and habit patterns of any; a community area including only farm, or farm and small town or village people; organizational experience as indicated by number of years of collective action; a minimum of conflicting attitudes, beliefs, customs, and interests; a collectivistic rather than an individualistic attitude on the part of the people; and outside stimulation or leadership.

**Local rural leaders in Washington,** H. W. Starling and F. R. Yoder (*Washington Col. Sta. Bul. 257 (1931), pp. 35, fig. 1*).—This study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, sets forth and analyzes some of the factors contributing to the making of local rural leaders. It is based upon a sample of such leaders, including 181 men and 69 women in 8 counties of the State. Membership of these leaders in community organizations, churches, and lodges, and their attendance at agricultural meetings are discussed. Analysis is made of how the leaders became interested in the problems and activities in which they are engaged; their age, sex, formal education, and current reading; their participation in community activities during their youth; parental encouragement given them; number of years' residence in the present and other agricultural communities; and the occupations followed before farming and in addition to their present farming activities. The attitudes and traits of leaders and the qualifications for successful leadership are discussed.

The leaders studied were found to be engaged chiefly in social and economic activities, 84.4 per cent being active in the grange. The most efficient leaders attended more meetings dealing with agriculture and participated in more local community activities than the less efficient leaders. Men held more leadership positions than women. Church membership and activity appeared to have little influence on leadership ability. Few definite, organized attempts to interest young people in the vital problems and needs of rural life were made prior to the advent of the 4-H club work. Most of the leaders were of middle age or older, the average age being 47.2 years. Parental encouragement during adolescence was given to only 42.8 per cent of the leaders studied. Of the leaders studied, 88 per cent had completed the eighth grade, 42 per cent a 4-year high school course, 29.6 per cent had attended college, and 12.8 per cent were college graduates.

The activities during adolescence considered by the leaders as most influential in leadership training were speaking and parliamentary practice in school, literary societies, and community clubs; debating in school and literary societies; athletics in school; preparing papers in literary societies; and committee work in community clubs. The mobility of leaders was found not to be very great, 90.4 per cent having lived in the present community over 5 years, 62 per cent over 15 years, and 26.8 per cent over 30 years. Over 50 per cent had always been farmers, and nearly 70 per cent were following no other occupation at the time of the study. Practically all the leaders read at least one daily newspaper, and the number of weekly, semimonthly, and monthly magazines and papers read averaged over 4. Marketing needs, lack of cooperation and organization, rural backwardness or lack of education, poor production, and excessive taxation were considered by the leaders studied to be the outstanding problems of agricultural people.

The traits for leadership most often mentioned by the leaders were pleasing personality, tact, education, speaking ability, energy, practical knowledge of farming, love of humanity, honesty, ability as a mixer, and unselfishness.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**Extension program in agriculture and home economics for 1932** (*Illinois Sta. Circ. 383* (*1932*), *pp. 23*).—Twenty-six extension projects planned with a view of being especially helpful in tiding over the present difficult situation in agriculture are outlined. How farmers may obtain information needed to put the practices into effect and the plans of the extension service in carrying out the projects are described. The regular extension projects are also listed.

## FOODS—HUMAN NUTRITION

**Report of the committee on methods of testing cake and biscuit flours,** M. M. Brooke (*Cereal Chem.*, 8 (*1931*), *No. 4*, *pp. 252–265*).—Among the papers included in the report of this committee of the American Association of Cereal Chemists are the following:

*Report of subcommittee on methods of scoring*, R. A. Barackman (pp. 252, 253).—This gives a tentative score card to be used in judging cakes. In a score of 100, 30 points are given to external appearance, including 10 for symmetry of crust, 15 for volume of loaf, and 5 for thickness, tenderness, sugariness, and color of crust. The remaining 70 points are divided as follows: 15 for tenderness and 15 for silkiness of crumb, 25 for size and uniformity of cell structure, and 15 for color.

*Report on methods of incorporating ingredients in cake batters*, L. H. Bailey (pp. 255–259).—This is the report of a collaborative study of the "creaming" method in comparison with the "single stage" method of mixing ingredients in cake batter, a standard procedure being followed in each case. Ten experienced collaborators, using their own flour and equipment, baked cakes by two different formulas with the two methods.

The average of all of the scores made by the two methods with each of the two formulas indicated that the single stage method was preferable to the creaming method, although there were individual instances where the reverse was true. It was concluded that the single stage method of adding ingredients is preferable, on account of its simplicity, for a standard method of mixing in testing various flours.

*Some observations on family flour*, J. A. Dunn (pp. 262–265).—On the theory that baked goods of the batter type (muffins, scones, pancakes, biscuits, and gingerbread) will always be made in the home to a large extent, experiments were carried on with three popular family patent flours milled from hard wheat, a pastry flour, and a package cake flour to determine which type of flour is best suited to batter type cooking.

Biscuits made from the family patent flour scored higher in each case, although those made from the soft flour were a little more tender and had a whiter color. The patent flours were also superior for cheese biscuits, scones, muffins, and gingerbread. It was possible to make good pastry from both types of flour, although the patent flour was easiest to manipulate. For various cakes, the package cake flour gave the best results. By adjusting the formula good cakes were made with the patent flours. The author concludes that "where they are available, a housewife should keep both kinds of flour among her supplies. The breadstuffs, pastry, and the batter types will be of higher quality when baked from the family patent, whereas the cakes will score much higher if made from a soft wheat flour."

**Report of activities of the A. A. C. C. research fellow,** P. P. Merritt and M. J. Blish (*Cereal Chem., 8 (1931), No. 4, pp. 267–292, figs. 3*).—This report deals with studies of the effect of various factors considered to be chiefly responsible for great variability among different operators in the standard laboratory test baking procedure first proposed by Blish (E. S. R., 59, p. 591). The studies included comparisons of hand mixing of the dough with three types of machine mixing, of hand molding with machine molding, and of three types of ovens.

Prolonged machine mixing tended to give larger loaves, but of greater variability than hand mixing. Machine molding tended to reduce variability and is recommended as convenient and timesaving.

**The utility of mechanical moulding in experimental baking,** W. F. Geddes and C. H. Goulden (*Cereal Chem., 8 (1931), No. 4, pp. 293–299*).—This paper discusses some of the main features of an extensive series of experiments involving 4,040 individual baking tests to compare hand with machine molding in experimental baking. The following conclusion is drawn:

"Hand molding does not appear to be a factor of major importance in causing variability between replicate bakings. Since punching and molding personality both contribute to the variability between bakers, the introduction of mechanical molding may be expected to reduce but not eliminate the large differences in mean loaf volume which different operators working in the same or different laboratories secure in replicate bakings of the same flour. The manual manipulation of doughs during molding is not a factor of such great importance as has been commonly supposed by workers in this field, and much detailed work yet remains to be done in elucidating and eliminating the factors responsible for variability before the accuracy of the experimental baking test can be brought within desirable limits."

**A supplementary procedure with the basic baking test for use with low diastatic flours,** M. C. Markley and C. H. Bailey (*Cereal Chem., 8 (1931), No. 4, pp. 300–305, figs. 2*).—This contribution from the Minnesota Experiment Station calls attention to two types of variables which must be considered in comparing the baking values of different flour samples. These are (1) the variables carried in the genetic constitution of the variety of wheat from which the sample of flour has been milled and (2) the variables due to environment. In studying the differences in the baking qualities of flours due to the first of these factors, it is necessary to control the variables of the second type. These are classified as of two sorts: (1) The chemical composition, in so far as it is subject to environmental control, and (2) enzymic activity. Baking tests are reported showing wide variations produced in baking tests on the same variety of wheat grown in different parts of the State attributable to variations in diastatic activity, and a method is proposed to control this variable. This consists in substituting in the baking formula 3 per cent of flour of high diastatic activity milled from wheat sprouted for 3 or 4 days.

**[Refrigeration and frozen foods]** (*Food Indus., 3 (1931), No. 5, pp. 182–231, figs. 74*).—This entire issue is devoted to papers on various uses of modern refrigeration, including the following: Storing Fruits and Vegetables by Refrigeration, by E. L. Overholser (p. 185); Concentrating Fruit Juices by Freezing, by M. G. Weber (p. 187); Refrigeration Stabilizes Egg Supply, by L. D. and M. Ovson (p. 191); Refrigeration in the Milk Industry, by J. P. Kirkup (p. 192); Refrigeration in the Curing of Meat, by C. R. Moulton (pp. 192, 193); What Happens during Quick-Freezing, by H. F. Taylor (pp. 205, 206); Florida Produces Frozen Orange Juice, by L. V. Burton (pp. 208-211); and Where Quick-Frozen Vegetables Stand Today, by C. Birdseye (p. 213).

**The basal metabolism of south Indian women, E. D. Mason and F. G. Benedict** (*Indian Jour. Med. Research, 19 (1931), No. 1, pp. 75-98, fig. 1*).—This study, which is a part of the extensive survey under the auspices of the Carnegie Institution Nutrition Laboratory of the metabolism of various races, was carried on at the Women's Christian College, Madras. Basal metabolism determinations were made on 54 native women ranging from 17 to 31 years of age. The Benedict portable apparatus supplemented by graphic records was used with the usual technic, and supplementary data were obtained on sitting and standing heights, weight, pelidisi, and pulse rate.

The body weights and standing heights of the subjects were low, the former ranging from 33.4 to 67.6 kg., with an average of 45 kg., and the latter from 145 to 167 cm., with an average of 154 cm. The sitting heights were lower than the calculated values, suggesting that these subjects had relatively shorter stem-length and longer legs than westerners. The state of nutrition, as indicated by the pelidisi, was normal, comparing favorably with that of normal western women.

The pulse rates ranged from 48 to 83, with an average of 68 beats per minute. The respiratory rates were high, averaging 19 respirations per minute. The oxygen consumption varied from 120 to 185 cc., with an average of 150 cc. per minute. The total heat production averaged 1,050 calories. The heat production per square meter of body surface varied from —5.3 to —33 per cent in terms of the Harris-Benedict standards, with an average of —16.9 per cent. Corresponding deviations from the Aub-Du Bois standards were from —4.6 to —28.7 per cent, with an average deviation of —17.2 per cent. Although these low values are thought to point to a definitely low racial metabolism, other possible causes are being investigated.

**The age factor in the response of the rat to level of dietary protein, A. H. Smith and T. S. Moïse** (*Jour. Nutrition, 4 (1931), No. 2, pp. 261-265*).—In this study of the effect of the concentration of dietary protein on the weight gains in rats of different ages, observations were made on male albino rats from all of which the right kidney had been removed. The rats were grouped by four different ages, 30, 90, 180, and 360 days at the beginning of the experiment, and were fed rations containing 18, 60, and 85 per cent of protein for 56 and 150 days, at the end of which time some of the animals from each age group were killed and observations and organ measurements made.

All of the animals which were 30 days old at the beginning of the experiment grew satisfactorily both for the 56- and the 150-day periods, but the gains in weight of the animals on the very high protein ration were distinctly less than on the other two. The ratios of total calories ingested to grams of gain in weight were almost identical on the three diets. In the shorter period the averages were 13.9, 12.2, and 13.7 and in the longer 23.4, 23.5, and 24.2 for the 18, 60, and 85 per cent diets.

In the group 90 days old at the beginning of the experiment, the increases in body weight were less, but the relative gains on the 60 per cent protein equaled or exceeded those on the low protein. The animals on the very high protein, while not gaining as much in weight, were in excellent physical condition on autopsy. The rats 180 days old at the beginning gained even less and again the ones on the highest protein made the smallest gains, but were in good condition at the end of the experiment. Rats 360 days old at the beginning gained little. Those on 60 per cent protein compared favorably with those on 18 per cent, but those on 85 per cent protein lost weight and showed on autopsy noticeably less subcutaneous and intra-abdominal fat.

It is concluded that "maintenance, growth, and general well-being are promoted in rats of widely different ages when the ration contains 38 per cent of the calories as protein, as well as or better than when only 12 per cent are derived from this foodstuff. Furthermore, good, though not maximal, rates of growth are supported in young rats 30 days of age at the beginning of the feeding period on a ration, 67 per cent of the total calories of which arises from its protein content."

**Studies on the relation of manganese to the nutrition of the mouse,** A. R. KEMMERER, C. A. ELVEHJEM, and E. B. HART (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 623–630, figs. 3*).—In the feeding experiments reported care was taken to prevent any contact of the young with the stock ration of the mother. When the young were 17 to 18 days old they were transferred with the mother to glass cages and supplied with whole cow's milk alone. On weaning, generally at 21 days of age, each litter was divided into two groups, one of which received milk supplemented with sufficient iron and copper to furnish each mouse 0.15 mg. of iron and 0.01 mg. of copper daily. The other group received in addition sufficient manganous chloride to supply each mouse with 0.01 mg. of manganese daily. In a few cases the milk was supplemented with a practically manganese-free food mixture consisting of casein 20, lactose 75, and butterfat 5 per cent.

As judged by comparisons of carefully matched litter mates, the growth of the animals receiving manganese was definitely superior to that of the animals receiving no supplement. The ovulatory rhythm of all the females on the experimental diets was followed by the vaginal smear method. In the mice receiving no manganese, the number of oestrous cycles was greatly reduced. In no case were more than two cycles reported during periods of 10 weeks or more. On the diets supplemented with manganese, the frequency of the cycles was approximately normal, the interval never being greater than 14 days. In the groups containing both males and females on the manganese-low diet no pregnancies occurred, while some of the females on receiving manganese mated and gave birth to normal litters.

**Raw versus pasteurized milk.—I, Anemia development, growth, and calcification,** W. E. KRAUSS, J. H. ERB, and R. G. WASHBURN (*Ohio Sta. Bimo. Bul. 154 (1932), pp. 3–6, figs. 3*).—Using paired feeding methods, a test was undertaken to determine the rate of anemia development in 23 pairs of rats fed either raw or pasteurized milk. The milk used was obtained from cows fed a good dairy ration and was handled in a manner to prevent metallic contamination. Little difference was found in the rate of anemia development on the two kinds of milk. Similar results were obtained with commercial pasteurized milk as with milk pasteurized under laboratory conditions.

In order to measure the value of the two kinds of milk for growth, 13 pairs of rats were fed. Sufficient iron and copper were added to the milk to prevent anemia. At the end of a 12-weeks period the femurs were removed from 5 pairs and the ash content was determined, while the entire bodies of other pairs, minus the contents of the intestines, were ashed. There was no significant difference in the ash content of the femurs or of the entire bodies of the animals fed either kind of milk.

**Present status of acidophilus milk,** W. D. FROST, H. T. BUTTERWORTH, and S. M. FARR (*Amer. Jour. Pub. Health, 21 (1931), No. 8, pp. 862–866*).—This brief summary is based upon an extensive survey of the literature on the subject, a number of references to which are appended.

**Transformation of the intestinal flora through the feeding of unfermented acidophilus milk,** R. P. Myers (*Amer. Jour. Pub. Health, 21* (*1931*), *No. 8, pp. 867–872*).—To meet the objection of many to the taste of ordinary cultured acidophilus milk, an unfermented product has been developed by inoculating milk pasteurized at high temperature with cultures of the organism and storing the product until used at a temperature not exceeding 10° C. (50° F.).

The paper reports feeding experiments on rats and a more extensive series on human subjects to determine whether or not the cells of *Lactobacillus acidophilus* suspended in unfermented milk are capable of being implanted in the intestines. "In the 16 experiments on human subjects, successful implantation of *L. acidophilus*, as determined by the plate method, was obtained in each case. In 12 of the 16 experiments a predominant *L. acidophilus* flora was obtained by the regular consumption of approximately 1 qt. of unfermented acidophilus milk per day, no other modification of the ordinary diets of the subjects having been made."

**The influence of an exclusive meat diet on the flora of the human colon,** J. C. Torrey and E. Montu (*Jour. Infect. Diseases, 49* (*1931*), *No. 2, pp. 141–176*).—Essentially noted from a preliminary report (E. S. R., 64, p. 579).

**Vitamin standards and units** (*Brit. Med. Jour., No. 3696* (*1931*), *pp. 862, 863*).—A brief report is given of the recommendations of the conference held in London in June, 1931, under the auspices of the Permanent Standard Commission of the Health Organization of the League of Nations for the purpose of formulating a stable standard for each known vitamin, of defining in terms of such a standard an arbitrary unit of activity for the vitamin in question, and of considering whether in each case any method or methods of testing could be recommended.

It was agreed by the conference that in the present state of knowledge these questions could be discussed to advantage only in the case of vitamins A, B ($B_1$), C, and D, and that the units should be defined in terms of a standard substance rather than a biological test on account of the unavoidable differences to be expected in various laboratories in the growth and behavior of experimental animals. The standards and units finally recommended by the conference and adopted by the Commission are as follows:

For vitamin A carotene was recommended temporarily as the standard of reference, with a selected sample of cod-liver oil as a second provisional standard. The carotene standard is to be made from a number of samples of pure carotene prepared in certain specified laboratories by the Willstätter method. The recommended unit is the vitamin A potency of 1γ (0.001 mg.) of the standard.

For vitamin B ($B_1$) the standard is the adsorption product of an extract of rice polishings on fuller's earth prepared in the Medical Laboratory, Java, by the method of Seidell, as described by Jansen and Donath (E. S. R., 57, p. 489), and the unit the antineuritic value of 10 mg. of this adsorption product.

The standard for vitamin C is the fresh juice of the lemon (*Citrus limonum*) and the unit the activity of 0.1 cc. of the juice.

The standard for vitamin D is the standard solution of irradiated ergosterol issued from the National Institute for Medical Research, Great Britain, and already in use as the vitamin D standard in Great Britain (E. S. R., 64, p. 295). The unit is defined as the activity of 1 mg. of the standard.

Few recommendations were made concerning the relative merits of different methods of biological assay, the consensus of opinion being that, inasmuch as the test substance and the standard preparation are investigated simultaneously by the same method, the test substance should show the same value in terms of the standard whatever biological technic is proposed. In regard to vitamin

D, the conference decided that "the 'line' test, X-ray examination, or determination of the bone ash, are all equally reliable methods," and concerning vitamin B that methods both "prophylactic and curative in type and employing either the rat or pigeon as experimental animal may yield equally valid results."

The standard preparations are to be kept at the National Institute for Medical Research, Hampstead, and will be issued to suitable individuals and institutions under certain conditions.

The hope is expressed that the units established will be widely used in reinvestigating the vitamin content of medicinal preparations and foodstuffs. "When this has been done, it should be possible to calculate not only the protein, fat, and carbohydrate content of human dietaries, but also their vitamin content. Certainly it should not be difficult to investigate in this manner the unbalanced diets which lead to deficiency disease. Sufficient knowledge of the vitamin value of different human dietaries should eventually enable us to estimate man's actual requirements in this respect."

**International vitamin standards** (*Brit. Med. Jour., No. 3696 (1931), pp. 857, 858*).—This editorial comment on the recommendations of the international conference on vitamin standards, noted above, emphasizes the importance in clinical medicine of the adoption of uniform standards for vitamin preparations. "Now that the units should have the same meaning in all countries, comparable clinical data ought soon to be available for determining the effective and safe dosage of each of these vitamins in its different applications. The League and the laboratories have done their parts. The practical outcome is in the hands of clinical medicine."

**Vitamin A potency of retinal tissue**, A. M. YUDKIN, M. KRISS, and A. H. SMITH (*Amer. Jour. Physiol., 97 (1931), No. 4, pp. 611–616, fig. 1*).—The retinal tissue of pigs' eyes was found to be a rich source of vitamin A. In curative tests a dosage of 30 to 50 mg. of the dried material was sufficient, while in prophylactic tests 20 mg. permitted normal growth and well-being in young rats. The accompanying choroid tissue contained little, if any, vitamin A.

"The recent studies of von Euler and his collaborators [E. S. R., 61, p. 793], Capper [E. S. R., 64, p. 112], Green and Mellanby [E. S. R., 63, p. 791], and Moore [E. S. R., 64, p. 393] in which a generic relationship between the natural pigment carotene and vitamin A has been strongly implied suggest that the vitamin A (or its precursor) localized in the retina may bear a more or less direct structural relationship to the retinal pigment."

**Isolation of oryzanin crystals (antineuritic vitamin) from rice polishings.—I, Report**, S. ODAKE (*Imp. Acad. [Japan] Proc., 7 (1931), No. 3, pp. 102–105, fig. 1*).—Attempts to isolate by the Jansen and Donath method (E. S. R., 57, p. 489) the antineuritic vitamin from active oryzanin, a concentrate prepared from rice polishings, are reported. Crystals were obtained, but in the form of monoclinic plates instead of needles as reported by Jansen and Donath. These melted at 250° C. and were readily soluble in water, difficultly soluble in absolute alcohol, insoluble in acetone, benzol, and ether, and precipitable by phosphotungstic acid. The elementary analysis corresponded more closely to an empirical formula of $C_6H_8N_2O_2HCl$ than the $C_6H_{10}N_2O.HCl$ of Jansen and Donath.

Pigeons suffering from polyneuritis as a result of exclusive feeding with polished rice were cured in a few days by the daily injection of 0.01 mg., and in a few hours by 0.02 mg. of the crystalline substance. With 0.05 mg. there was also a gradual increase in body weight. In pigeons on a synthetic vitamin B-free diet, the recovery was more rapid and the increase in body weight more marked following the administration of the crystals. In preventive experiments with the synthetic diet, the feeding of 0.02 mg. of the crystals daily kept the pigeons in good health, although there was a slight loss in body weight. Polyneuritis developed in 10 days following the withdrawal of the crystals.

Young rats on the vitamin B-free diet developed symptoms in 14 days, but recovered promptly and resumed growth at a nearly normal rate when fed 0.02 mg. of the crystals daily. In preventive experiments the same amount sufficed for growth at a rate of from 1 to 1.2 gm. daily for 70 days.

**Studies in the physiology of vitamins.—XV, Some observations of the effect of administration of the antineuritic and heat stable factors on the anorexia characteristic of lack of the vitamin B complex,** G. R. Cowgill, H. A. Rosenberg, and J. Rogoff (*Amer. Jour. Physiol., 96 (1931), No. 2, pp. 372–376*).—This continuation of the series noted previously (E. S. R., 66, p. 198) reports the first of a series of experiments, an extension of which has already been noted from a preliminary report (E. S. R., 66, p. 93), leading to the conclusion that the anorexia developing in dogs on a diet lacking in the vitamin B complex may be attributed to the vitamin B ($B_1$) component rather than to vitamin G ($B_2$).

**Is the rat dermatitis consequent on vitamin $B_2$ (G) deficiency true pellagra?** S. S. Gurin and W. H. Eddy (*Jour. Expt. Med., 54 (1931), No. 3, pp. 421–429, pls. 2, fig. 1*).—The authors, with the assistance of J. Denton and M. Ammerman, have obtained evidence of two distinct types of dermatitis in rats One of these was found to resemble histologically that of human pellagra and blacktongue in dogs, as described by Denton (E. S. R., 60, p. 793). This appeared occasionally in rats on a vitamin $B_2$-deficient diet supplemented with sufficient vitamin $B_2$ in the form of beef extract or neutral autoclaved yeast to produce good growth. The other type of dermatitis, similar in appearance to that described by other workers, occurred in rats on an unsupplemented vitamin $B_2$-deficient diet.

"It is suggested that dermatitis in rats may be of diverse type; one resulting from vitamin $B_2$ (G) deficiency quite different histologically from human pellagra, and one closely allied to human pellagra and backtongue in dogs due to lack of some at present unidentified factor."

**Rickets in rats.—XII, The acid-base equilibrium of the blood in rickets and tetany,** A. T. Shohl, H. B. Brown, C. S. Rose, D. N. Smith, and F. Cozad (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 711–719*).—In this continuation of the series of papers noted previously (E. S. R., 63, p. 695) the literature dealing with the question of the significance of acids and alkalies in rickets and tetany is reviewed briefly, and studies are reported which were designed to evaluate the acid-base equilibrium of the blood serum of rats with experimental rickets and tetany. For the production of rickets the Steenbock-Black diet 2965 was used, and for comparison the Sherman normal diet B and the same plus enough alkali to equal that of the rickets-producing diet. As additional controls, some of the rats on the ricketic diet were given 15 mg. of cod-liver oil daily.

In the tetany studies two types were selected, that produced by fasting and that produced by increasing the phosphorus content of the rachitic diet 2965 to bring the Ca : P ratio either to 2 or 1. The acid-base equilibrium of the serum was determined by measurement of the pH and $CO_2$, with confirmatory evidence by analysis of chlorides, total base, and protein.

The data showed that in rickets the acid-base equilibrium of the blood may border on alkalosis, while tetany produced by fasting and phosphate feeding in rats previously made ricketic on a high calcium-low phosphorus diet results not in an alkalosis but an acidosis.

In discussing these results the authors point out that the main question is not whether acidosis or alkalosis is an accompaniment of rickets or tetany but whether it is an essential part of the syndrome. "Whatever may be the interpretation on a theoretical basis, the facts seem to warrant the conclusion that rickets is not necessarily associated with an acidosis, and that tetany is not necessarily associated with alkalosis."

## TEXTILES AND CLOTHING

**Textile fibers and their use,** K. P. Hess (*Chicago: J. B. Lippincott Co., 1931, pp. XIV+354, figs. 175*).—This volume, one of the Lippincott series of Home Economics Texts edited by B. R. Andrews, presents on a level suited to college instruction certain fundamental facts concerning textile fibers and fabrics of importance to the consumer as a basis for intelligent selection and use. The unit-problem plan of organization of the material is followed, the subject matter being presented in three sections entitled textiles, fabrics, yarns, and fibers; the textile fibers; and textiles and the consumer. Each section contains from three to six units, composed of several problems. Laboratory exercises are suggested at the end of many of the problems and guide questions and literature references for additional study at the end of each unit. Numerous illustrations are given throughout the volume. Two appendixes are given dealing, respectively, with suggested lesson assignments and additional laboratory exercises.

**Carpet wear testing machine,** H. F. Schiefer and A. S. Best ([*U. S.*] *Bur. Standards Jour. Research, 6* (*1931*), *No. 6, pp. 927–936, figs. 8*).—"A machine for testing the resistance to wear of carpets and similar floor coverings when they are subjected to definite wearing forces under controlled conditions has been developed at the [U. S.] Bureau of Standards. The forces are chosen to produce the bending, slipping, twisting, and compression of the pile which takes place when a carpet is walked upon.

"A circular sample of the carpet to be tested is tacked on a turntable which is brought to bear against two leather-covered wheels. One of the wheels is driven by a motor and in turn drives the turntable. The other wheel is used as a brake to produce slipping of both wheels on the carpet as it rotates. A vacuum cleaner removes the material which is worn off. The wear on the carpet is produced by a downward force, a horizontal stress, and a slight twisting motion. They have definite values and may be varied. The rate of wear is evaluated by measuring the change in thickness of the pile of the carpet with a sensitive thickness gage as the test proceeds.

"The machine can be used to test the relative durability of carpets under definitely specified conditions. Whether the results are a satisfactory measure of probable relative durability of carpets in service has not been determined. The machine should be useful for studies of the effect of various factors on carpet wear and for studies of the relation between the composition and construction of carpets and their resistance to wear."

## HOME MANAGEMENT AND EQUIPMENT

**Family living expenditures, Summit County, Utah, 1930,** E. Hayball and W. P. Thomas (*Utah Sta. Bul. 232* (*1931*), *pp. 31, figs. 11*).—This study, made in cooperation with the Extension Service of the Utah State Agricultural College, is based on farm management and family expenditure records for 51 families for the year 1930. Tables and charts are presented and discussed showing the costs, by items and percentages that each item was of the total for the class, for food, clothing, household operation, shelter, health, education and advancement, and total expenditures. Other tables and charts show the average expenditures, total and by classes and per adult male equivalent, for the families grouped according to the amount of expenditures. Data are included as to the personnel of the families, education of the parents, rooms and conveniences in the home, and the value of house and furnishings.

The average cash income of the families was $2,520, of which $1,391 was used for cash expenditures for the farm, leaving $1,129 for family living. The average total living cost per family was $1,663, of which $530 worth of goods had been furnished by the farm. The expenditures for different groups of items were for food $505, of which $258 was furnished by the farm; shelter and furnishings $308, of which $240 was furnished by the farm; clothing $218; use of automobile $152, of which $32 was supplied by the farm; household operation $132; education $104; life insurance $74; health $56; contributions $52; personal expenditures $48, and other expenditures $15. Of the families, 11.7 per cent reported expenditures less than $500, 25.5 per cent from $501 to $1,000; 39.2 per cent from $1,001 to $1,500; and 23.6 per cent more than $1,500. Expenditures per adult male equivalent averaged $364, varying from $221 in the group spending less than $500 to $487 in the group spending from $1,501 to $2,000.

The cash expenditure per family increased in proportion to increase in income. Certain items, such as food and household operation, remained fairly constant on the basis of the adult male equivalent, while clothing showed a uniform increase and expenditures for advancement, life insurance, and use of automobile a decided increase as income increased. It was found that until the income available for family living reached $1,000 or more, family requirements above necessities could not be provided.

**Clothing and houselinen expenditures of 99 rural families of Mississippi during 1928–29,** D. Dickins (*Mississippi Sta. Bul. 294* (*1931*), *pp. 39, figs. 6*).—This bulletin is based on data obtained from records of time and money expenditures for clothing and household linen kept by housewives in 10 counties of the State, the period covered being the year beginning October, 1928.

The average expenditures of money and time for the family for the year were: Clothing, $203.94 and 178 hours 24 minutes; house linen, $9.19 and 46 hours 42 minutes; and dry cleaning, $3.11 (plus 7 cts. worth of supplies) and 4 hours 12 minutes. The average weekly expenditures for laundry were 34 cts. in money, 6 hours 1 minute in time, and 11 cts. for supplies; mending averaged 1 hour 42 minutes per week, and repair and care of shoes $3.18 per year. An average of 13.7 per cent of the total value of family living was spent for clothing and 0.6 per cent for house linen.

Cost of clothing, time expenditures for construction of clothing, and cost of house linen increased as the value of family living increased, but the proportion of the value spent on clothing and house linen decreased. Both money and time expenditures for clothing were greater in the fall and spring than in winter and summer. Fall and winter were the higher seasons for house linen. Money expenditures for clothing were also affected by composition of the family, distance from church, and the education of the operator and home maker. Education of the home maker affected money expenditures for house linen. The average money expenditures for clothing for different age and sex groups varied considerably, as did those for husbands and wives in different age groups.

**Housing and house operation costs on Nebraska farms,** J. O. Rankin (*Nebraska Sta. Bul. 264* (*1931*), *pp. 41, figs. 13*).—This bulletin deals mainly with size of house and household, household conveniences, and cost of housing and house operation. It is based chiefly on (1) a survey of 342 farms in 4 counties, made in 1924; (2) answers by 343 wives of crop reporters to a questionnaire mailed in 1919 by the Cooperative Extension Service, U. S. D. A.; (3) data on size of house and household obtained in cooperation with the Bureau of Agricultural Economics, U. S. D. A., from 1,141 farm families in 11 counties; and (4) data on home equipment in 1926 obtained from 3,477 farm families by the home demonstration office of the Nebraska Extension Service as a part of a nation-wide survey conducted by the General Federation of Women's Clubs.

Some data obtained in the 1926 survey regarding urban homes in Nebraska are also presented for comparison.

Tables and charts summarizing the data as to size of homes, rooms and persons per house, rooms per person, overcrowding, unused rooms, water in the house, sewage disposal, heating, cooking, and lighting facilities, power on the farm, value and rent of house, cost of furniture and furnishings, and cost of fuel and light are given. The groupings are chiefly on the basis of tenure and in some cases by expenditure groups and tenure. The data for the 1926 survey are grouped chiefly by districts of the State. Some comparisons are made with those of Kirkpatrick for 11 States studied (E. S. R., 56, p. 185).

The study indicated that the Nebraska farm homes studied are fairly typical of the average American farm home in size, rooms per person, value of house, and annual value of housing and house operation. Only a small percentage of the Nebraska farms had any of the conveniences studied except a telephone, and modern sanitary sewage disposal was seldom found. Owners' and part-owners' houses were larger and more valuable and were much better equipped with modern conveniences than the houses of tenants. Owners and tenants spent about the same amount for furnishings, fuel, and miscellaneous operation costs. Part owners spent a higher amount. In general, housing standards decreased from the eastern to the western areas studied

## MISCELLANEOUS

**Report of the Alaska Agricultural Experiment Stations, 1930,** H. W. ALBERTS (*Alaska Stas. Rpt. 1930, pp.* [2]+*48, figs. 13*).—This contains the organization list and a report of the several lines of work carried on. Meteorological data and other features of the work are abstracted elsewhere in this issue.

**The Forty-fourth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1930–31,** C. P. GILLETTE ET AL. (*Colorado Sta. Rpt. 1931, pp. 52*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1931, a report of the director on the work of the station, and departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

**Eleventh Annual Report [of Georgia Coastal Plain Station], 1930,** S. H. STARR (*Georgia Coastal Plain Sta. Bul. 16* (*1931*), *pp. 86, fig. 1*).—This contains the organization list and a report of the director on the work of the station. The experimental work reported is for the most part abstracted elsewhere in this issue.

**Forty-fourth Annual Report [of New York Cornell Station], 1931,** A. R. MANN (*New York Cornell Sta. Rpt. 1931, pp. 112*).—This contains a summary of the progress on the more important research projects of the station during the year 1930–31, together with references to the publications of the year. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

**Forty-fourth Annual Report of the South Carolina Experiment Station, [1931],** H. W. BARRE ET AL. (*South Carolina Sta. Rpt. 1931, pp. 125, figs. 40*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1931, and a report of the work of the station during the year The experimental features reported not previously noted are for the most part abstracted elsewhere in this issue.

**Forty-fourth Annual Report [of Vermont Station, 1931],** J. L. HILLS (*Vermont Sta. Bul. 332* (*1931*), *pp. 29*).—This contains the organization list, a report of the director, and a financial statement for the fiscal year ended June 30, 1931. The experimental work reported is for the most part abstracted elsewhere in this issue.

# NOTES

**Arkansas University.**—A new poultry plant has been built at the university farm. This plant contains a headquarters house, a laying house, a feed house, brooder houses, range houses, and various other housing units. It will accommodate 1,000 laying birds and ultimately take care of double this number.

**California Station.**—Dr. F. B. Lincoln, research associate in plant pathology, has resigned, effective March 31, to accept an appointment in the University of Maryland. Harold Compere, research assistant in entomology, has been authorized to undertake in China and India a search for insect enemies of the citrus red scale, one of the most serious pests of the citrus industry.

**Delaware Station.**—Donald McCreary succeeded L. L. Williams as assistant entomologist on April 1. Raymond Russel has been appointed research fellow in soil bacteriology and plant pathology beginning March 1.

**Illinois University.**—Dr. Kendric C. Babcock, for 18 years dean of the College of Arts and Sciences and provost since 1920, died March 11. Dr. Babcock was born in South Brookfield, N. Y., on September 8, 1864, and was educated at the University of Minnesota and Harvard University, receiving the Ph. D. degree from the latter in 1896. He had taught various subjects in the University of Minnesota and the University of California, and served as president and professor of history in the University of Arizona from 1903 to 1910 and as specialist in higher education in the Bureau of Education of the U. S. Department of the Interior from 1910 to 1913.

**Purdue University and Station.**—The aggregate enrollment for the second semester exceeds that for any corresponding period, reaching 4,443, or 147 more than on the same date in 1931. This includes 370 students in agriculture and 415 in home economics.

Dr. Byron E. Pontius, associate professor of animal husbandry since 1919, died March 16, aged 44 years. He was in charge of the university flock of pure-bred sheep, and in addition to instruction duties had carried on research in genetics and the formation of urinary calculi in sheep. He was a native of Ohio and graduated from the Ohio State University in 1914. Subsequently he received from the University of Wisconsin the M. S. degree in 1924 and the Ph. D. degree in 1927. He had served as head of the department of animal husbandry at Alfred University from 1914 to 1917 and as assistant professor of animal husbandry in the Massachusetts College from 1917 to 1919.

**Iowa College and Station.**—A retort for the continuous destructive distillation of cornstalks, cobs, straw, and oat hulls, said to have been the first of the kind which has been built, has recently been installed.

The retirement on June 30 is noted of Dean and Director C. F. Curtiss, associated with the institution since 1892. Pending the selection of a successor, President R. M. Hughes will assume the duties of dean of agriculture.

**Kansas College and Station.**—Dr. W. H. Metzger has been appointed assistant professor of soils, effective April 1. Dr. F. L. Duley, professor of agronomy, has been given general charge of research work in soils, in which he will be assisted by Dr. Metzger and H. E. Myers.

**Massachusetts College and Station.**—Following a report of a special committee on limitation of enrollment, decision has been reached to restrict the admission of women students next fall to 75 and of all first year students to 300. No restriction was deemed necessary for the graduate school or the Stockbridge School of Agriculture. The restrictions were imposed as a result of limited housing and instructional facilities.

Because of continued ill health, President R. W. Thatcher has presented his resignation effective not later than September 1. He has been tendered a research professorship in the station. Also effective on September 1, F. A. Waugh will retire as head of the division of horticulture, but will remain head of the department of landscape architecture. R. A. Van Meter, professor of pomology, has been appointed head of the division of horticulture.

Ray M. Koon, research professor of vegetable gardening and in charge of the work at the Waltham Field Station, has been granted six months' leave of absence, beginning April 1. for study in continental Europe and Great Britain.

**Mississippi College.**—The name of the institution has been changed by the legislature from Mississippi Agricultural and Mechanical College to Mississippi State College. In consequence the post office, telegraph office, and express office addresses have been similarly redesignated State College.

**Missouri University and Station.**—Dean and Director F. B. Mumford has returned from six months' absence in European countries, where he made a study of agricultural education, research, and the general agricultural situation and of what governments are doing to aid agriculture. Dr. A. E. Murneek, associate professor of horticulture, has returned from a similar absence spent in studying the work being done by institutions in eastern and central Europe and in Russia in the field of plant physiology.

W. R. Fankhanel, instructor in agricultural economics, has resigned to accept a position with the Federal Land Bank of St. Louis.

**Nevada Station.**—The recently reorganized department of meteorology has chosen as its central work the revision of a manuscript on snow surveying in relation to forecasting stream flow. This manuscript has already been mimeographed by the United States Reclamation Service for its use, but to assure a wider use will be published as a research monograph by the station.

A report on snow survey problems in the Humboldt Basin has recently been prepared and printed, and a forecast of run-off in this basin during the present season is now in press. Because of the dried out condition of the watershed due to a succession of four dry years and also to the presence of a large body of low level snow accumulated on the floor of the basin under subnormal winter temperatures this year, the problem of forecasting is very complex. Furthermore, there is no year of record with which to make comparison.

Since the meteorologist of the station has been appointed chairman of the committee on the hydrology of snow in the American Geophysical Union, the station has become the center of investigations of all types of problems connected with the snow. At present it is furthering a questionnaire being sent throughout America and abroad regarding the present status of snow studies and teaching. The results of this questionnaire will be presented at the annual meeting of the union.

**New Hampshire University and Station.**—An advisory council of 20 farmers for each of three commodities, poultry, potatoes, and dairying, was assembled at the university in March by Director J. C. Kendall to review both the research and extension programs. Both production and economic projects were discussed, and each commodity group met separately on different days. Each county of the State was represented. The plan proved so successful that it is likely to be continued in the future.

A new dairy barn to house the university herd has been built and will be occupied this spring.

**Rutgers University.**—*Science* notes that the State University of New Jersey is made the ultimate beneficiary of the bulk of an estate valued at $128,000 left by Edward Randolph Wood, who died February 14 in his ninety-second year. Mrs. Wood receives the income accruing from the estate during her lifetime. The suggestion is made in the will that the bequest be devoted "to the study of the elimination and destruction of animal and vegetable pests." The summer home of the family at Richland, near Vineland, is to be held "as a residential, social, and educational center or home" for officers, faculty members, students, or others connected with the university.

**Cornell University.**—Ellwood Wilson has been appointed acting professor of silviculture vice S. N. Spring, resigned to become assistant dean of the New York State College of Forestry at Syracuse University.

**New York State Station.**—Aside from a small number of copies to be sent to libraries, exchanges, and similar groups, the station has discontinued the use of classified mailing lists for its general and technical bulletins and will rely for its main distribution upon return post card announcements. This change in plan went into effect March 1 and is expected to permit of a reduction of editions on most bulletins of 50 per cent.

**Ohio State University.**—Dean Alfred Vivian, associated with the institution since 1902, has resigned effective July 1.

**Oregon College.**—Under a reorganization of the higher educational system of the State, approved by the governor to become effective with the opening of the fall term, a single president of higher education with headquarters at the State capital is to be selected as the senior administrative officer of the State college, the State university, and the three State normal schools, while vice presidents or senior deans will be immediately in charge of each institution. The number of schools in the college and university are to be reduced from 41 to 12, with a corresponding number of deans. The university organization will include schools of literature and arts, social science, business administration and commerce, fine arts, and physical education, while those at the college will comprise agriculture, home economics, physical and biological sciences, engineering, forestry, and pharmacy. Announcement is made of an expected saving in operation of the two institutions in excess of $1,000,000 per annum.

**Virginia Truck Station.**—Director Thomas C. Johnson died March 31 at the age of 62 years. He had been head of the station since its establishment in 1907, and had previously held positions in horticultural work in the University of Missouri, Cornell University, and West Virginia University. He was a graduate in 1896 of the last-named institution, and served as president of the American Society for Horticultural Science in 1917.

**Wisconsin University and Station.**—Don S. Anderson, instructor and assistant in agricultural economics in the Minnesota University and Station, has been appointed assistant professor of agricultural economics, effective March 29. John A. James, assistant dean of the College of Agriculture since 1919, has been appointed director of the department of agricultural education and has been succeeded as assistant dean by Dr. Ira L. Baldwin, who will also continue as associate professor of bacteriology.

**Hannah Dairy Research Institute, Scotland.**—This institute (E. S. R., 60, p. 797) was formally opened in 1931 in its permanent location at Auchincruive in Ayrshire. Buildings have been erected and equipped from a capital grant of £15,000 from the Development Fund. The main structure contains experimental laboratories devoted, respectively, to physiology, biochemistry, nutrition, bacteriology, and pathology, as well as administrative and other offices and a library and reading room. The farm buildings have been renovated and extended, and include a specially constructed metabolism house with accommodations for feeding trials with three cows and with goats and other small animals. A dairy herd of about 40 pedigreed Ayrshire cattle has been acquired, as well as a flock of sheep and a small number of goats. Investigations under way deal with the nutrition of ruminants, the physiology of lactation, the breeding of dairy cows, bovine tuberculosis, and the condensing and drying of milk and its by-products. The director of the institute is Dr. Norman C. Wright.

**Fourth International Agricultural Education Congress.**—This congress is being arranged to meet in Rome in November, 1932, under the auspices of the International Federation of Technical Agriculturists and with King Vittorio Emanuele III of Italy as high patron. Sections are contemplated for higher education, secondary education, popular and post-school education, general education in the country and agricultural sociology, and agricultural home economics teaching. The general secretary is Dr. Franco Angelini, Via Vittorio Veneto, 7, Rome, Italy.

**Sixth International Botanical Congress.**—An executive committee has been formed for this congress, of which Dr. F. A. F. C. Went, Utrecht, is president, while Dr. J. C. Schoute, Groningen, will act as vice president, Dr. W. C. de Leeuw, Bilthoven, as treasurer, and Dr. M. J. Sirks, Wageningen, as secretary. The committee has decided that the congress will meet at Amsterdam September 9–14, 1935.

**Necrology.**—Sir William Somerville, professor of agriculture and rural economy at Oxford University from 1906 until his retirement in 1926, died February 17 at the age of 72 years. Dr. Somerville was a pioneer worker in agricultural science in Great Britain. Beginning in 1889 as a lecturer in forestry in the University of Edinburgh, he was subsequently professor of agriculture and forestry in Durham College of Science (now Armstrong College) from 1891 to 1899, the first occupant of the Drapers' professorship of agriculture at Cambridge University from 1899 to 1901, and assistant secretary in the Board of Agriculture and Fisheries from 1902 to 1906. While much interested in the promotion of agricultural education and demonstration, he also carried on considerable experimental work at an early date, much of it in numerous local stations between Solway Firth and the North Sea on crops of arable land, and began pasture studies in 1899.

Dr. Jan Paulus Lotsy, eminent in the field of genetics, died November 17, 1931. Dr. Lotsy was born in 1867 and educated at Göttingen University. He came to the United States in 1890, where he was lecturer in Johns Hopkins University and studied the assimilation of nitrogen by wheat. He also spent five years in Java investigating the localization of alkaloids and the embryology of several plants. Taking up genetics, he became in 1904 lecturer in systematic botany at Leiden and two years later director of the State herbarium there. In 1909 he was appointed secretary of the Dutch Association of Sciences and studied hybridization of Antirrhinum, Oenothera, Cucurbita, and other genera and later extented his research to other plants and to man. He had been editor of *Botanisches Centralblatt*, *Progressus rei Botanicae*, *Genetica*, and *Resumptio Genetica*.

Dr. R. Stenhouse Williams, first director of the British National Institute for Dairying and research professor of dairy bacteriology in the University of

Reading, died February 2, aged 60 years. He did much by his studies in dairy bacteriology and his numerous writings to promote technical education in all branches of the milk industry, as well as research in the nutritional value of milk and the production of a clean, safe milk supply at moderate cost.

Dr. Robert Shaw Wilkinson, president of the Colored Normal, Industrial, Agricultural, and Mechanical College of South Carolina since 1911 and a member of its staff since 1896, died March 13, aged 67 years. He was educated at Oberlin College (A. B., 1891) and Columbia University (Ph. D., 1904), and was widely known as a leader in negro education.

**New Journals.**—*Zeitschrift für Ernährung* is being published monthly at Leipzig as a journal for the discussion of nutrition questions as related to research and practice. The initial number contains abstracts, book reviews, and miscellaneous notes, with the following original articles: The Significance of Iodine in the Metabolic Processes of the Human Organism, by J. Stoklasa (pp. 3–15); German Milk Production, by R. Wiehr (pp. 15–18); The Potato Crop in 1930, by H. Wilbrandt (pp. 18–20); Market Supply without Storage by Marketing Agencies, by K. Brandt (pp. 21–25); The Influence of Hard Waters on the Cell in Cooking, by W. Ziegelmayer (pp. 25–30); The Proper Nutrition of School Children, by E. Schröder (pp. 31–34); and The Principles of Winter-suffering Measurement in Food Districts, by Michaelis (pp. 34–36).

*Stylops*, a journal of taxonomic entomology, is being published by the Entomological Society of London "to meet the demand for the prompt publication of short taxonomic papers." The initial number contains six articles, among which is New South African Curculionidae (Col.), by G. Marshall (pp. 1–6).

*Food Technology* is being published as a monthly review of food manufacture, processing, and transportation at 158 Stratford High Street, London, E. 15, England. The initial number deals especially with various types of food spoilage.

*Husbandry* is a quarterly published by the department of agricultural education of the Norfolk County Council, England. It deals with the "science of Norfolk farming."

**Miscellaneous.**—Dr. C. B. Williams, lecturer in agricultural and forest zoology in the University of Edinburgh, has been appointed professor of entomology in the University of Minnesota for the spring quarter of 1932 for a series of lectures on advanced entomology. On July 1 he will become chief of entomology at the Rothamsted Experimental Station vice Dr. A. D. Imms, who has been appointed head of the new department of entomology at the University of Cambridge.

Harold K. Plank, entomologist for the Tropical Research Plant Foundation since 1923, has been appointed supervising entomologist for the California State Department of Agriculture with headquarters at Sacramento and entered upon his new duties April 1.

Courses in applied animal nutrition, applied animal breeding, and animal parasitology leading to the M. S. degree have recently been announced by Macdonald College.

Dr. Joseph H. Grisdale, deputy member of agriculture for Canada since 1919 and previously a pioneer agriculturist and director of the Dominion Experimental Farms, retired March 9.

# EXPERIMENT STATION RECORD

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## EDITORIAL

### THE FIFTIETH ANNIVERSARY OF THE STATE EXPERIMENT STATIONS IN NEW YORK, OHIO, AND MASSACHUSETTS

The year 1882 is noteworthy in the annals of agricultural research, since no fewer than three of the State agricultural experiment stations date from that time. The States under whose legislative sanction these stations were established are, in the chronological order of their action, New York, Ohio, and Massachusetts. Though by no means the first stations in the field, this trio typified the growing interest in agricultural experimentation which characterized the period, and favored as they were by sound basic ideals, capable guidance, and relatively generous financial support they early achieved a position of wide influence.

The formal organization of each of the three stations reflected a definite crystallization of public sentiment in favor of State support for experimental work in agriculture. In all three States such work had already been undertaken by their agricultural colleges, but thus far it had been conducted without direct State appropriations or similar direct public endorsement.

In Massachusetts, there had been considerable experimentation at the Massachusetts Agricultural College ever since its opening in 1867. The conviction was expressed in 1875 by Hon. Charles L. Flint, secretary of the board of trustees, that "could the college farm or a portion of it be organized and established as an experiment station and provided with the requisite means, it would go far to meet a great and growing public want and do more real good for the agriculture of the present and the future of the Commonwealth than any other agency." Three years later an offer from Prof. Levi Stockbridge to give $1.000, representing royalties derived from the sale of his fertilizers, for the establishment of such a station was accepted by the college trustees and a committee of organization appointed. Subjects of investigations were assigned to different members of the faculty, an improvement of the original Sturtevant lysimeter was built, and data were collected on soil and atmospheric moisture, dew formation, and similar topics, as well as studies of the possibilities of sorghum and other plants for sugar production, the effect of fertilizers on the composition of fruits, the control of peach yellows, and other problems. Because of the lack of funds, however, this station ceased to function in 1881.

In New York Prof. I. P. Roberts had begun experiments with field crops at Cornell University in 1874, and five years later the university had definitely organized as one of its departments the Cornell University Agricultural Experiment Station. Although the funds at the disposal of this station had been extremely small, considerable valuable work had been carried on by the instruction staff on a voluntary basis.

At the Ohio Agricultural and Mechanical College, later the Ohio State University, experiments had for some time been under way by Dr. Norton S. Townshend, professor of agriculture. In 1878 a farm department had been established under the superintendency of Dr. Townshend and with Dr. C. E. Thorne as farm manager. Variety tests with cereals, fertilizer and cultural trials, and studies in cattle feeding had been conducted by various faculty members.

Doubtless this early experimentation by the colleges helped materially to bring about a decision by the respective legislatures to organize experiment stations. In each case, however, when this step was taken, instead of appropriations to the colleges essentially independent institutions were set up, with separate boards of control. An act of June 26, 1880, established the New York Agricultural Experiment Station with a governing board consisting largely of executive officers of the 10 principal agricultural societies of the State. The board arranged for the purchase of a farm of 125 acres at Geneva, and this farm, following the passage of additional legislation in 1881 designed to meet objections raised as to the constitutionality of the previous act, was duly taken over by the new institution on March 1, 1882. Dr. E. L. Sturtevant, who had carried on considerable experimental work privately on a farm in Massachusetts, was named as the first director.

On April 17, 1882, the Ohio Agricultural Experiment Station was established "for the benefit of practical and scientific agriculture and for the development of the vast agricultural resources of the State." By mutual agreement of its board of control and the university trustees, the new station was located on the university farm. About 25 acres were set aside for its work, and the professor of horticulture, Mr. W. R. Lazenby, was made director.

The Massachusetts Experiment Station was authorized by an act of the legislature approved May 12, 1882. Under this law the station was definitely located at the college, though with its own board of control. In the following November Dr. C. A. Goessmann, professor of chemistry since 1869, was appointed director.

The period of about five years which preceded the passage of the Hatch Act was one of considerable development. A "general announcement" issued by the Ohio Station declared its preparedness "to test varieties; to analyze and test fertilizers and manures, soils, waters, milk, cattle food, etc.; to examine weed seeds that are suspected of being unsound or adulterated; to identify and name weeds and other plants; to investigate and describe when known the habits of injurious and beneficial insects; and other work of a similar character that properly comes within its province." Much attention was likewise given in New York and Massachusetts to many of these matters, in which public interest was then especially keen, but the foundation was also laid for more fundamental studies. The Massachusetts Station became widely known for its applications of agricultural chemistry, while the Ohio Station gave special prominence to soil fertility and other agronomic problems and the New York Station to horticulture and dairying.

Upon the passage of the Hatch Act the Ohio Station was reorganized and designated as the recipient of the Federal grant. In Massachusetts and New York, however, a different policy was pursued. The Hatch Experiment Station was set up on the campus as the experimental department of the Massachusetts Agricultural College, while in New York it was the Cornell Station which was reorganized and for some years received the entire Federal allotment. As regards administration, the net immediate result was therefore the continued maintenance of two stations in New York and the provision of an additional station in Massachusetts. Still further differentiation of State and college agencies followed in 1892, when the Ohio Station was removed to a farm of its own which had been acquired at Wooster.

Ultimately, however, closer relations were attained between the stations and the colleges. In 1895 the Hatch and Massachusetts Stations, which had been increasingly cooperating in a division of the field, were formally united. In 1923 the New York State Station, while continuing its work and organization at Geneva, became an integral part of the Cornell University. Four years later an understanding was reached between the respective boards of control of the Ohio State University and the Station whereby a substation was organized at the university and manned by members of the faculty of the college of agriculture. Thus the end of the half century finds the experimental work in these States administered under some form of unified control and also with research, instruction, and extension well coordinated.

Interest in these stations by their respective States has continued and intensified with the passing of the years. One measure of the esteem with which they are regarded locally is found in the large proportion of their financial support which has continued to be derived from State funds. The initial appropriation for the New York State Station was $20,000 per annum for two years. From 1882 to 1887 the Ohio Station was supported wholly by State appropriations which averaged $4,575 per annum, and the Massachusetts Station for some years depended chiefly for its maintenance upon a State allotment of $5,000 per annum. These were all considerable sums for the times, but they do not loom large when compared with State appropriations for 1931 of $378,913, $371,795, and $187,821, respectively.

Measured by the increase in personnel, the growth has been equally impressive. The scientific staff of the New York State Station as listed in its report for 1882 included a director, an assistant, a horticulturist, and a chemist; in 1932 it numbers about 70, distributed among departments of bacteriology, botany, chemistry, dairying, editing, entomology, pomology, and vegetable crops. The director, chemist, botanist, and superintendent of field experiments in Ohio have been replaced by departments of administration, agronomy, animal industry, botany and plant pathology, dairy industry, rural economics, editorial work, agricultural engineering, entomology, forestry, home economics, and horticulture, with a total technical staff of about 140, some of whom, however, are also engaged in instruction in the Ohio State University. In Massachusetts the original three-man staff, comprising a director and chemist, a superintendent of field and stock experiments, and a superintendent of horticultural experiments, microscopist, and draftsman, has been expanded to over 75 full-time and part-time specialists in such groups as agronomy, animal husbandry, bacteriology and physiology, botany, chemistry, dairy industry, editorial work, agricultural economics, agricultural engineering, entomology, farm management, home economics, horticulture, poultry husbandry, and veterinary science.

The sphere of influence of the stations, at first largely restricted to the immediate vicinity of their plats and barns, has been greatly broadened by the development of numerous substations. In Ohio these have largely taken the form of numerous regional and county experimental farms; in New York by a vegetable research station on Long Island, the Chautauqua vineyard laboratory, and extensive work with orchard and small fruits in field stations in the Hudson Valley; and in Massachusetts by special cranberry and market gardening substations. There has also, of course, been much cooperation of less permanent type with other institutions and individuals.

Close contacts with farmers have been sought from the beginning. The early bulletins of the New York State Station were published through newspapers, the earliest of these bearing the date of July 24, 1882. This station was also the first to appoint a full-time editor and to issue popular editions of its bulletins for general distribution. The Massachusetts Station, too, was prompt and prolific in publications, and the Ohio Station began a series of elaborate annual reports in 1883. In addition to many technical articles, circulars, reports, and miscellaneous publications, the regular bulletins have aggregated over 500 in Ohio, over 300 in Massachusetts, and nearly 600 for the New York State Station.

To attempt to discuss the findings of these stations, even by bare enumeration, would far exceed the space limits of this review. From the beginning their work has been carefully planned and ably executed. In thoroughness, precision, and dependability it has reflected consistently the characteristics of its leadership. Under Lazenby and Thorne in Ohio, Sturtevant and Collier in New York, and Goessmann in Massachusetts, the foundations were well and solidly laid, and the superstructure which has followed has been in keeping.

Specific mention should be made of the early staff as well as of the executives. Some of the pioneer workers, such as Green in Ohio and Maynard in Massachusetts, completed long and useful careers at their respective institutions. Others, among them Babcock, Goss, Wing, Ladd, and Arthur at Geneva and W. E. Stone, Wheeler, Penhallow, and Allen in Massachusetts, went on to render conspicuous service elsewhere. Perhaps one of the most valuable contributions to agricultural research by these stations, as well as by others in operation prior to the passage of the Hatch Act, was through the development of a corps of competent young men qualified by training and experience to meet the suddenly enlarged needs when a nation-wide system of experiment stations became, through the granting of Federal aid, an actuality.

The stations whose fiftieth birthdays are now at hand may well look back upon their record with pride and satisfaction. Established at a time when there were few precedents and often none too clear a conception as to objectives, they proceeded conservatively but constructively. There has been little of the sensational or the spectacular, but even less of the ephemeral and the superficial. Patiently and persistently a great store of exact knowledge has been accumulated by their endeavors.

So far as is known, no elaborate observance of their anniversaries is contemplated by any of the three stations, but in New York a modified program provides for recognition of the event through special exhibits, addresses, and publications, and particularly by a series of gatherings on the grounds by numerous groups throughout the year. Among these are the northeastern section of the American Society of Agronomy, which is expected to meet at Geneva on June 22, a regional meeting of the laboratory section of the International Association of Milk Dealers, the fruit section of the Sixth International Congress of Geneticists on August 25, and a considerable number of the farm organizations of the State.

The *Record* takes this opportunity to extend its congratulations to the three stations and its best wishes for the future.

## NEW JERSEY'S AGRICULTURAL EXPERIMENT STATION, 1880–1930

Under the title given above, the New Jersey Station has recently published an elaborate volume depicting the history of the institution during its first 50 years. This volume contains about 650 pages, is copiously illustrated, and presents attractively as well as authoritatively the beginnings and development of experimental work in the State. The authors are Dr. Carl Raymond Woodward, station editor from 1915 to 1927, and Mrs. Ingrid Nelson Waller, formerly associate editor. Extracts from the address of Director J. G. Lipman at the semicentennial celebration of the station serve as an introduction.

In the main, the treatment followed is departmental. Relatively brief chapters deal with the agricultural background, the formative years and Dr. George H. Cook, reorganization and expansion (associated with Dr. E. B. Voorhees), and specialization and readjustment (under Dr. Lipman), A final chapter depicts the fiftieth anniversary observance (E. S. R., 63, p. 701), and an appendix brings together in a convenient form much statistical data on such matters as legislation, personnel, appropriations, and publications.

Since from 15 to 45 pages each are available for most of the 20 departments, the inclusion of a large amount of information has been possible without sacrifice of readability. The personal side of the work has deservedly been given prominent consideration, and great pains has been taken to present not merely a chronology but an interpretation. Dealing with material drawn largely from annual reports, too frequently disparaged as devoid of human interest, the authors point out that in reality such reports " contain between their black board covers a story with a certain romance all its own. In them are bound up the chief life work of several scientists and the partial life work of many more. Taken as individual volumes they are an excellent record of efforts made from year to year to utilize science for the advancement of rural life. Taken as a work of fifty separate volumes they stand for an epic in agricultural progress, under an inspired leadership. One traces through the years the story of patient application and faithful performance."

Originally conceived as a phase of the anniversary celebration, this history adds a finishing touch to an already notable occasion. A unique contribution to station literature has been produced. The successful completion of so ambitious and useful an undertaking should be deeply gratifying to all concerned.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**Investigations on the preparation and behaviour of vitamin $B_1$ concentrates from yeast,** B. C. GUHA (*Biochem. Jour., 25 (1931), No 3, pp. 931–944, figs. 6*).—This investigation was undertaken to determine how far the method of fractionation previously applied to wheat embryo (E. S. R., 63, p. 9) could be followed in the concentration of vitamin $B_1$ from yeast, and whether or not any evidence concerning the multiple nature of vitamin $B_1$, as suggested in the wheat embryo studies, could be obtained with yeast as the raw material.

In testing the activity of the various fractions, the technic employed in the earlier investigation was followed with a few modifications. Each fraction was tested on at least two and usually more rats, and the results were checked periodically by pigeon curative tests. In commenting upon recent discussions in the literature concerning technic for the assay of vitamin $B_1$, the author states that in his experience rat-growth tests have yielded fairly uniform results, although it is possible that in the final stages of fractionation Smith's curative method (E. S. R., 63, p. 291) might give more trustworthy results, as well as being more economical.

Preliminary tests with known substances credited at one time or another with properties of vitamin $B_1$ gave negative results. The substances tested included adenine picrate, guanine hydrochloride, uracil, synthetic *dl*-thyroxine, and histamine acid phosphate. Comparisons of the vitamin $B_1$ potency of aqueous extracts of brewer's top yeast and baker's yeast showed considerable variations in different samples of both types, but with somewhat greater activity for the brewer's yeast which, accordingly, was used in the fractionation studies.

The fractionation, each stage of which is described in considerable detail, was followed successfully through the platinum stage, although the final activity was not as great as in the earlier fractionation of wheat embryo. The final platinum precipitate was active in doses containing 0.075 to 0.1 mg total solids as compared with 0.015 mg in the wheat embryo experiments. The curative pigeon day dose of the fraction contained 0.047 mg total solids as compared with 0.005 mg for the corresponding fraction from wheat embryo.

Attempts to carry on the fractionation through the gold chloride stage gave unsatisfactory results as determined by the rat growth tests. The pigeon curative tests indicated that there was considerable activity in both the precipitate and filtrate fractions, but a combination of the two fractions did not give much greater activity than each alone. The pigeon tests showed such large individual variations, however, that the results are considered untrustworthy.

Preparations obtained at three different stages in the fractionation were tested for their secretagogue activity. Two of them showed a marked depressor effect. The nature of this depressor principle is not understood, but the observations are thought to confirm the earlier experiments of Anrep and Drummond (E. S. R., 45, p. 665) as opposed to those of Voegtlin and Myers (E. S. R., 44, p. 765).

The bios activity of the fraction at the phosphotungstic acid stage was negligible, as was the case with the wheat germ fraction at the same stage. Tests for cozymase activity gave negative results, and observations of the absorption spectra of various vitamin $B_1$ concentrates gave results considered of no significance. Other tests applied to various vitamin $B_1$ concentrates are summarized as follows: "Some vitamin $B_1$ concentrates are optically inactive and give negative ninhydrin and Adamkiewicz-Hopkins reactions. The Pauly reaction given by the purer yeast concentrates is comparatively weak. Vitamin $B_1$ is not apparently precipitated by flavianic acid from a fairly concentrated preparation."

In conclusion the somewhat discouraging statement is made that "about the actual chemical nature of vitamin $B_1$ nothing can yet be said with confidence. Jansen and Donath's crystals have now been stated to contain vitamin $B_4$ [E. S. R., 65, p. 593]. Williams, Waterman, and Gurin [E. S. R., 64, p. 294] in a recent investigation could not obtain the pure crystals, while Mukherji (1929) states that by following Jansen and Donath's procedure in the main and working with rice polishings he has obtained crystals identical with those described by Jansen and Donath. It is not clear, however, that the crystals were pure. The tests, which were carried out on ricebirds (*Munia maja*) showed that 30 mg of the crystals per day were effective for protection from 'polyneuritis.' Lower doses do not appear to have been tried. The Pauly reaction given by different vitamin $B_1$ concentrates from rice polishings and yeast can not yet safely be attributed to the vitamin per se."

**The preparation of vitamin C concentrates from lemon juice, J. L. Svirbely and C. G. King** (*Jour. Biol. Chem., 94 (1931), No. 2, pp. 483–490*).—The method employed for concentrating the active material from lemon juice was that of Grettie and King (E. S. R., 62, p. 501), with slight modifications found necessary in working with larger quantities of the starting material. The principal modification was in the acetone extraction of the active material after the second active precipitate had been deleaded with 1:1 HCl, followed by ethyl alcohol. The subsequent stages in the concentration are described as follows:

"The alcohol solution was concentrated to 5 cc in vacuo (12 to 14 mm) at a bath temperature of 70–80° C. Small amounts of hydrochloric acid were added if the liquid did not remain strongly acidic, and 15 volumes of acetone were added. A white semicrystalline mass was thrown down which was extracted twice with small amounts of acetone. The acetone solution was evaporated to dryness in vacuo at a bath temperature of 70–80° in the presence of very fine, carefully purified quartz and the darkened residue extracted with absolute acetone overnight. The residue was again extracted with fresh portions of acetone for at least 5 hours."

The final active preparations were distinctly acid and showed strong reducing properties. Carbylamine and phenolic tests were negative and orcinol and resorcinol tests strongly positive. The most concentrated preparations obtained were active in doses containing the equivalent of from 0.03 to 0.5 mg of total solids per cubic centimeter of the original juice. Solubility tests indicated that the vitamin is "soluble in petroleum ether-acetone (1:1), petroleum ether-butyl alcohol (2:1 and 4:1), petroleum ether-propyl alcohol (1:1 and 3:1), ethyl acetate, butyl alcohol, and propyl alcohol, but insoluble in absolute ethyl ether. Ammonia gas destroys the active material when passed into solutions containing the vitamin dissolved in organic solvents."

**The preparation and storage of vitamin C concentrates from lemon juice, F. L. Smith, 2d, and C. G. King** (*Jour. Biol. Chem., 94 (1931), No. 2, pp. 491–496*).—The principal points brought out in this continuation of the studies noted above, in addition to observations already noted in previous papers of the series, are that the H-ion concentration at which the active material is precipitated by lead acetate is at from pH 7.3 to 7.5, as determined both by the quinhydrone and the hydrogen electrodes and standard indicators, that citric acid and formic acid are no better than hydrochloric acid for the protection of the active factor during the preparation and storage of vitamin C concentrates, and that dry ice furnishes a particularly suitable storage medium for keeping the purified preparations for two or three weeks.

**Crystalline vitamin D,** F. A. Askew, H. M. Bruce, R. K. Callow, J. St. L. Philpot, and T. A. Webster (*Nature [London], 128 (1931), No. 3235, p. 758*).—This is a brief note announcing that the crystalline preparation of vitamin D previously named Calciferol by the authors (E. S. R., 66, p. 9) has been found to contain an inactive contaminant which they have named Pyrocalciferol. This was discovered by treating Calciferol in pyridine with 3:5-dinitrobenzoyl chloride and subjecting the esters formed to fractional crystallization. Two esters have been repeatedly recrystallized, one of these Calciferyl 3:5-dinitrobenzoate in lemon-colored plates with a melting point of 145 to 147° C. and the other Pyrocalciferyl 3:5-dinitrobenzoate in orange-colored prisms with a melting point of 167.5 to 169.5°. On hydrolysis the former yields Calciferol with a melting point of 114.5 to 117°, an antirachitic activity of 40,000 International Units per milligram, and in alcohol solution an intense absorption band with a maximum at 265 mμ. The latter yields on hydrolysis Pyrocalciferol with a melting point of 92 to 94°, no antirachitic activity, and in alcohol solution an absorption band with maxima at 296, 284, and 274 mμ. Both Calciferol and Pyrocalciferol have the same empirical formula as ergosterol. The specific rotation of Calciferol in acetone is given as $[\alpha]^{20}_{D}+81°$.

It is noted that Calciferol as thus purified resembles closely in physical properties the preparation of Linsert named by Windaus vitamin $D_2$, as noted below, but is of much higher antirachitic activity than has been reported as yet for vitamin $D_2$. It is considered not to be identical with the antirachitic concentrate of Reerink and van Wijk (E. S. R., 62, p. 804) on account of the great instability, lower absorption, and lower antirachitic activity of the latter product.

**Crystallized vitamin $D_1$** [trans. title], A. Windaus, A. Lüttringhaus, and M. Deppe (*Liebigs Ann. Chem., 489 (1931), No. 3, pp. 252–269, figs. 2*).—This paper discusses in greater detail than the one noted previously (E. S. R., 66, p. 8) the investigations which have been carried on in the senior author's laboratory for more than four years in an effort to isolate vitamin D, and the relation of the crystalline products finally prepared to those reported by Bourdillon et al. and Reerink and van Wijk. A footnote added later announces that a second crystalline antirachitic concentrate, vitamin $D_2$, has been obtained by O. Linsert from the unfiltered irradiation product obtained with a magnesium vapor lamp. This vitamin $D_2$ melts at 114 to 115° C., has a specific rotation in acetone solution of $[\alpha]_D+85°$, is more soluble in various organic solvents than is vitamin $D_1$, and has the same antirachitic activity.

**Observations concerning the antirachitic vitamin from irradiated ergosterol** [trans. title], A. Windaus and A. Lüttringhaus (*Hoppe-Seyler's Ztschr. Physiol. Chem., 203 (1931), No. 1–2, pp. 70–75*).—The authors discuss the chief characteristics of their crystalline compounds, vitamins $D_1$ and $D_2$, as noted above, with particular reference to the various theories which have been proposed concerning the chemical nature of the antirachitic vitamin.

The theory advanced by Gerlach that vitamins, enzymes, and hormones are not chemical identities but simply well-known chemical substances in an altered state through the absorption of radiant energy is considered disproved by the demonstration that vitamins $D_1$ and $D_2$ are stable isomers of ergosterol. The theory of Takamiya (E. S. R., 65, p. 205) that vitamin D is an ozonide of ergosterol is considered disproved by the fact that ergosterol preparations irradiated in the complete absence of oxygen have been obtained which are more than 2,000 times as active as Takamiya's most active preparation.

Concerning the toxicity of irradiation products, it is noted that both vitamins $D_1$ and $D_2$ are toxic in very high doses and produce a state of hypervitaminosis, as suggested by Kreitmair and Moll (E. S. R., 60, p. 693) among others.

In an addendum reference is made to the communication by Askew et al. noted above. The authors are of the opinion that the new Calciferol described by Askew et al. is identical with Linsert's vitamin $D_2$. They state that their vitamin $D_1$ also splits into two dinitrobenzoic esters, and that in their opinion vitamin $D_1$ is an addition product between vitamin $D_2$ and an isomeric alcohol.

**Chemical constitution of the vitamins** (*Lancet [London], 1931, II, No. 24, pp. 1307, 1308*).—A concise review of the present status of knowledge concerning the chemical nature of vitamins A and D.

**The effect of thiocyanates upon amylase activity, I, II** (*Contrib. Boyce Thompson Inst., 3 (1931), No. 2, pp. 277-285, 287-296, figs. 6*).—Two papers are presented.

I. *Potato amylase*, F. E. Boyce.—An attempt was made to account for the accelerated germination and reduced starch content of potato tubers treated with thiocyanate as a direct effect of the thiocyanate in hastening amylase action. Experiments were made both upon press juice and juice that had been dialyzed in collodion bags. Amylase activity was measured both by determining the increase in reducing sugars and by measuring the rate at which the starch was broken down into substances giving no blue color with iodine.

Both sodium thiocyanate and potassium thiocyanate decreased the sugar-producing activity when added in quantities exceeding 10 mg in 100 cc of the reaction mixture. Amylolytic activity was much less readily affected, 100 mg of the thiocyanate being required to produce a definite retardation. Reduction in amylolytic activity appeared unsuited for use as an index of small differences in the amylase effectiveness of potato juice.

"Stimulative effects upon potato amylase by thiocyanates were not observed. Within the limits of the amounts of thiocyanates absorbed by potato tissue in the chemical treatments (not more than 10 mg per 100 cc of juice), no effects were noted. Consequently, it is believed that neither the sprouting response nor the observed breakdown of starch of potatoes treated with thiocyanates is related to any direct effect which the chemical itself exerts upon the amylase of the potato."

II. *Salivary amylase*, L. P. Miller.—In the absence of sodium chloride, and at approximately the pH of saliva, the addition of potassium thiocyanate to give concentrations from 0.005 molar to 0.08 molar was found to increase the amylase activity of saliva. In the presence of sodium chloride in concentrations approximately that normally found in saliva and at pH 6.6, additions of potassium thiocyanate to give concentrations up to 0.06 molar produced no effect. With increasing concentrations of potassium thiocyanate the optimum pH for the hydrolysis of starch by dialyzed salivary amylase, in the presence of phosphate buffers, was shifted toward the alkaline side; this shift in some instances reached one pH unit, with high concentrations.

Potassium thiocyanate was able to depress, or to stimulate, or to be without effect on the amylase activity, according to the pH at which the reaction took place and upon the concentration of potassium thiocyanate. At low pH values all concentrations of potassium thiocyanate depressed, at high pH values all concentrations stimulated, and at certain intermediate pH values potassium thiocyanate depressed, or stimulated, or had no effect, according to the concentration. The effect of potassium thiocyanate upon the amylase hydrolysis of starch was found to be essentially the same, whether measured by viscosity changes, by color reaction with iodine, or by the formation of reducing sugars.

**Preparation and properties of crystallized alkali salts of l-cystine,** G. Toennies and T. F. Lavine (*Jour. Biol. Chem., 90 (1931), No. 1, pp. 203–213, figs. 5*).—The authors secured the lithium, potassium, and sodium salts of levocystine in crystalline form by precipitating them from alcoholic alkaline solutions of cystine with acetonitrile. The solubilities of these salts in water, in methyl alcohol, and in ethyl alcohol, their optical rotations, and the stability of their solutions are among the data recorded. The crystalline form and habit of these salts are indicated by photomicrographs.

**Note on the preparation of hydroxyproline,** H. K. Klabunde (*Jour. Biol. Chem., 90 (1931), No. 1, pp. 293–295*).—Contributed from the University of Illinois, the procedure here described involves the hydrolysis of gelatin, the separation of the group of amino acid copper salts soluble both in water and in methyl alcohol, and the separation of the hydroxyproline from proline by means of the insolubility of the hydroxy compound in absolute alcohol. From the alcohol-insoluble residue remaining after extracting proline with absolute alcohol, the hydroxyproline could be isolated as the picrate and the free amino acid obtained from the last-named salt. Working directions for the entire procedure are given.

**The alkaline decomposition of serine,** F. S. Daft and R. D. Coghill (*Jour. Biol. Chem., 90 (1931), No. 1. pp. 341–350, fig. 1*).—Serine was decomposed by heating in strongly alkaline solutions with the production, among other compounds, of ammonia, glycine, alanine, oxalic acid, and lactic acid. Pyruvic acid was identified as an intermediate decomposition product. Attention is drawn to the necessity of insuring the absence of serine in estimating arginine by alkaline decomposition. The usual precipitation of arginine with the other basic amino acids (E. S. R., 26, p. 22) was shown to be adequate for this purpose. In the distillation of ammonia from protein hydrolyzates by the methods in common use, serine was shown not to be decomposed to a significant extent.

**Some observations on the distribution of nitrogen in plant extracts that contain a high proportion of nitrate nitrogen,** A. C. Chibnall and E. J. Miller (*Jour. Biol. Chem., 90 (1931), No. 1, pp. 189–196*).—Fractionations of the nitrogen content of a sample of perennial ryegrass (*Lolium perenne*) characterized by a luxuriant growth coupled with a very poor agricultural quality, indicated that the very high concentration of nitrate nitrogen found (12.7 per cent of the total nitrogen, equivalent to potassium nitrate amounting to 4.4 per cent of the dry weight of the leaf) "shows that, under the appropriate conditions, leaves are capable of storing relatively enormous amounts of nitric acid." These figures are believed to be much greater than any previously recorded, with the exception of certain data for the tobacco leaf.

**The mechanism of iron catalysis in certain oxidations,** C. V. Smythe (*Jour. Biol. Chem., 90 (1931), No. 1, pp. 251–265, figs. 6*).—Ferrous iron in an un-ionized compound was readily oxidized to ferric iron by the oxygen of the air regardless of the acidity of the solution. An explanation of this reaction in terms of electron structure is put forward. The catalytic effect of ferrous and ferric iron in certain oxidations is discussed, together with a possible interpretation of the mechanism and of the meaning of the term activation of hydrogen.

**Estimation of nitric and nitrous nitrogen in soils,** G. S. FRAPS and A. J. STERGES (*Texas Sta. Bul. 439* (*1931*), *pp. 22*).—Discrepancies between the results obtained by the phenoldisulfonic acid method and those of certain other procedures including reduction methods were found to occur, chiefly by reason of the presence, in some cultures, of large proportions of nitrites. Nitrite nitrogen was not indicated by the phenoldisulfonic acid method, but did appear in the results obtained by the use of the other methods. It is considered that the colorimetric methods for nitrates and for nitrites should ordinarily be used for soils and for cultures obtained in nitrification experiments. For testing the colorimetric methods and for special purposes the zinc ferrous sulfate reduction procedure is suggested; and an adaptation of this procedure for use with soils is given in working detail, both a titrimetric determination of the ammonia, for relatively larger quantities, and a Nessler determination for smaller quantities of ammonia being included. The α napthylamine-sulfanilic acid diazotization method for nitrites is given in a form especially adapted for nitrite determinations in soils. Nitrites being allowed for, the phenoldisulfonic acid method checked very well against the results of reduction with zinc and ferrous sulfate. It is noted, however, that "the error due to matching the color with the standard in the phenoldisulfonic acid method for nitric nitrogen was found to average about 5 per cent of the amount of nitrogen present, while it was sometimes found to be as much as 13 per cent." The presence of calcium carbonate appeared not to affect the results obtained by this method. Ammonium hydroxide for developing the yellow color was preferable to sodium or potassium hydroxides.

Of manipulations involved in the preparation of samples for analysis it is noted that "lime was a good flocculating agent for soils in nitrate work. Potash alum may be used, but was less satisfactory. . . . Washing the soil residue 15 to 20 times is recommended. . . . Additions of oxidizing agents such as hydrogen peroxide gave higher results for nitrates on some of the cultures, when the colorimetric method was used, but their use was found to be unsatisfactory."

The importance of points seemingly of minor significance is stressed, and is given as the reason for the statement of details of the adaptations of method finally found satisfactory.

**Chemistry of butter and butter making.—I, A comparison of four methods for the analysis of butter with an explanation of a discrepancy found to exist in the fat determinations,** E. W. BIRD and D. F. BREAZEALE (*Iowa Sta. Research Bul. 144* (*1931*), *pp. 353–382*).—A modification of the A. O. A. C. complete butter analysis method, considered applicable to the work of control laboratories when eight or more samples are to be examined at the same time, was compared, together with the Kohman and the Mojonnier methods, with the A. O. A. C. Official method taken as a standard. The modified Official and the Kohman procedures gave results checking closely with those of the Official method.

"The variation between duplicates is attributed (a) to peculiarities in the emulsification of the fat in the extraction flasks, which caused incomplete extraction, and (b) to a blowing out of ether-fat solution around the stoppers when these are removed or to both.

"Data are presented which show that the value by which normal Mojonnier fat determinations are lower than the A. O. A. C. method is equivalent to the fatty acids, which are not extracted in the Mojonnier procedure but which appear as fat with the A. O. A. C. analysis. It is further shown that this difference was larger as the rancidity of the butter increased.

"The modified Official method is a rapid method and is considered sufficiently accurate for the analysis of good quality butter in control laboratory work. Likewise the A. O. A. C. method is considered to be accurate as an analytical standard for the analysis of good quality butter. The Kohman method as outlined is a rapid method sufficiently accurate for plant use.

"All three methods give values for fat which are too high by an appreciable amount for the analysis of rancid butter. The Mojonnier and the '10-gm' extraction methods give a closer approximation of the true fat value of rancid butter than do the dry extraction methods (A. O. A. C., modified Official and Kohman)."

**United States Food and Drug Administration methods of testing antiseptics and disinfectants,** G. L. A. Ruehle and C. M. Brewer (*U. S. Dept. Agr. Circ. 198 (1931), pp. 20, figs. 7*).—Working details of the methods officially prescribed for measuring the efficiency of various types of preparations are here assembled, the relative accuracy and dependability of the methods is discussed, and the cases to which each is most suitable to be applied are indicated. Some of the topics taken up are the determination of the phenol coefficient, the Food and Drugs Administration method, other tests for germicides and antiseptics, tests in the presence of organic matter, and tentative guide to method applicable in a given case. The circular contains also a tabulation of figures useful in making up the dilutions used in the testing of disinfectants.

## METEOROLOGY

**Recent weather abnormalities in the United States,** C. F. Marvin (*Bul. Amer. Met. Soc., 13 (1932), No. 1, pp. 1–3*).—It is pointed out that the year 1930 was one of unprecedented dryness and that 1931 was a year of abnormal warmth. Precipitation in 1931 was generally subnormal, particularly in limited sections of the Southeast and Northwest which had considerably less rain in 1931 than in 1930. The southeastern drought was broken by generous rains near the close of the year, and at the same time the Pacific States became better supplied with moisture than for a long time.

**The measurement and interpretation of forest-fire weather in the western Adirondacks,** P. W. Stickel (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 34 (1931), pp. 115, figs. 36*).—This bulletin deals primarily with the results of a study of the meteorological conditions which determine the moisture content and inflammability of duff, and with "means of correlating certain weather elements with duff moisture so that the estimating and forecasting of forest fire hazard can be done by meteorologists and weather observers by the use of ordinary meteorological instruments only." It is stated that the results "afford a means of determining just what degrees of hazard are usually associated with variations in air temperature, relative humidity, evaporation, etc." Of the major weather elements affecting fire hazard precipitation is shown to be the most important, but "the most accurate and practical measure of hazard is obtained with a combination of evaporation rate, hours since last measurable rainfall, and air temperature."

**Dry weather and drought** [trans. title], C. Kassner (*Ztschr. Angew. Met., Wetter, 48 (1931), No. 4, pp. 126–128*).—This article discusses briefly various definitions of dry weather and drought, with the conclusion that such definitions must be flexible, taking account of normal precipitation conditions with reference to time, amount, and plant needs.

**Humidity of the climate of Sweden and its influence on soil, vegetation, and forest** [trans. title], H. Hesselman (*Meddel. Statens Skogsförsöksanst. [Sweden], No. 26 (1930–31), pp. 515–559, figs. 7; Ger. abs., pp. 555–559*).—Using Martonne and Lang's factors based on the relation between precipitation and temperature, Sweden is divided into six climatic regions with reference to humidity as follows: Subarid, continental, transition, subhumid, humid, and superhumid. These regions are charted and discussed with reference to forest type and other vegetation and geological origin and type of soil.

A considerable list of references to investigations on the subject is given.

**Experiments with western American trees** [trans. title], O. Hagem (*Meddel. Vestland. Forstl. Forsøkssta. [Bergen], No. 12 (1931), pp. 217, pls. 4, figs. 10; Ger. abs., pp. 184–217*).—Studies of the climatic conditions of the original habitats of typical conifers of the northwest coast of North America and experiments to determine the adaptation of certain species to the almost treeless western coast of Norway are reported. Detailed data on meteorological conditions as related to forest growth in British Columbia and Alaska, as well as on the western coast of Norway, are given. The investigation was undertaken because previous studies had shown that seedlings from commercial seeds of American conifers were not winter-hardy on the west coast of Norway.

**Summary of meteorological records**, W. B. Haines (*Rubber Research Inst. Malaya Bul. 4 (1931), pp. [2]+27, figs. 12*).—Records of observations on rainfall, humidity, solar radiation (measured by the Callendar sunshine recorder), soil temperature, air temperature, wind, and barometric pressure in Malaya are summarized and discussed, particular attention being given to rainfall, solar radiation, and soil temperature from the viewpoint of agriculture. It is stated that the most obvious characteristics of the climate of Malaya are uniformity and high humidity. Rainfall, which is excessive (85 to 90 in. annually), is well distributed throughout the year but is distinctly higher during the periods April–May and September–December. Morning rains are rare. Considering intensity of rainfall with special reference to soil erosion, it is shown that "half the rain falls at a rate in excess of 0.5 mm a minute, which rate is within the normal range of the maximum absorption capacity of a wet soil. . . . The soil temperature under jungle is nearly constant at 75° F. The effect of clearing is to raise the mean soil temperature by 6 to 15°."

**The importance and methods of measurement of evaporation in agricultural meteorology** [trans. title], P. Carton (*Bul. Écon. Indochine, Sect. B, 34 (1931), Oct., pp. 900–933, pls. 4, figs. 3*).—This article discusses at some length the laws of evaporation, conditions affecting evaporation in nature, and methods of measuring evaporation, and reports results of several years' measurement by means of the Piche evaporimeter of evaporation under different conditions at stations of the Bureau of Climatology and Agricultural Meteorology of the Central Observatory of Indo-China. The data so far collected are not considered, as a rule, sufficiently complete to be of more than comparative value, but more complete and absolute values are being obtained on rice fields and those of the principal legume crops in cooperation with the hydraulic engineer and the agronomist.

**Smithsonian meteorological tables** (*Smithsn. Misc. Collect., 86 (1931), pp. LXXXVI+282, figs. 2*).—This is a revision of these tables, corrected to January, 1931, prepared under the direction of C. F. Marvin assisted by H. H. Kimball and others.

## SOILS—FERTILIZERS

**The physical properties of the soil,** B. A. KEEN (*London and New York: Longmans, Green & Co., 1931, pp. VI+380, pls. 2, figs. 93*).—The author, assistant director of the Rothamsted Experimental Station, notes as his primary object the provision for those interested in agricultural science of "a connected and critical survey of our knowledge of the physical properties of soil," adding that, "at the same time, I hope the book will also serve to show my fellow-physicists some of the attractive possibilities for research in a relatively unexplored branch of physics—the behavior of moist, porous materials displaying colloidal properties." Attention is further directed to the fact that although the physical were among the first properties of the soil to be studied systematically, soil physics was subsequently neglected in favor of chemical investigations, so that "although the early treatment of the subject was both rudimentary and defective, it survived and is still generally utilized in present-day textbooks of practical agriculture, especially in connection with the uses and effects of cultivation operations."

In recent years, however, "the whole subject has been reopened and placed on a firm physical basis, and many of the older ideas have had to be abandoned. There is little for surprise in this; an ancient art, such as agriculture, embraces many traditions and generalizations that do not survive the test of scientific examination, and the iconoclast serves an essential, albeit an unpopular, function."

**A study of methods for the preparation of permanent soil profiles,** H. J. HARPER (*Oklahoma Sta. Bul. 201 (1932), pp. 15, figs. 4*).—After a detailed study had shown a considerable number of methods to be inadequate, it was found that a dilute lacquer solution containing one part of lacquer with two parts of lacquer thinner was the most satisfactory binder to hold the soil particles or granules together so that they would not disintegrate after the soil profile had been secured. To complete the preparation, "any type of adhesive material which will not sag or flow at a temperature of 140° F. can be used to fasten the soil profile to a permanent background after the soil has been treated with a dilute lacquer solution and the lacquer allowed to dry. Asphalt or coal tar pitch is recommended because both of these materials are easy to secure and are inexpensive. Linoleum cement can be recommended to attach the soil profiles to a suitable background when they are mounted in the laboratory. . . . Blow sand or stony soils which are very difficult to handle can be mounted by this method and kept in a permanent condition without any appreciable change in color or structure."

Similar work by the New York State Station has been noted (E. S. R., 65, p. 17).

**Soils of Chouteau County,** L. F. GIESEKER (*Montana Sta. Bul. 252 (1931), pp. 63, pls. 4, fig. 1*).—Chouteau County, Mont., of which the reconnoissance survey here reported was made by the State Soil Survey in cooperation with the U. S. D. A. Bureau of Chemistry and Soils, covers an area of 3,957 square miles in the north-central part of the State, lies in the glaciated portion of the Great Plains, and is characterized by broad rolling to broken divides.

Scobey sandy loam, Scobey loam, and Joplin loam, which constitute 35, 31.9, and 12.3 per cent of the total soil area, respectively, are the more extensive soil types mapped and described. In all, 17 series of 26 types are listed.

**A preliminary survey of some of the soils in Kenya,** D. S. GRACIE (*Kenya Colony Dept. Agr. Bul. 1 (1930), pp. [2]+131, pls. 10*).—This report takes up field methods used, the meaning of the analytical determinations made, soil organic matter, subsoil conditions, and soil color; the localities examined and the soils found; and the improvement and upkeep of soil fertility. An appendix consists of notes on methods.

**Contributions to the study of some problems of soil chemistry,** H. H. Margulis (*Contributions à l'Étude de Quelques Problemes de la Chimie du Sol. Toulouse: Lab. Chim. Agr. et Inst. Agr. Univ. Toulouse, 1931, pp. [71], figs. 2*).—A method for the chemical study of the soil, with reference especially to lime and fertilizer needs, is presented in the form of a short monograph containing a summary presentation of the method, soil and limestone, available potassium and the mobilization of the soil potassium content, the fixation of ammonia from dilute solutions of neutral ammonium salts and the influence of limestone, the nature of ammonium fixation, and the action of concentrated solutions of neutral salts.

**On the nature of the reactions responsible for soil acidity,** J. N. Mukherjee and H. K. Sen (*Indian Jour. Agr. Sci., 1 (1931), No. 2, pp. 189–203, figs. 4*).—"It is not claimed that the systems dealt with in this paper present features identical in every respect with the colloidal clay acid or soil." It is, however, considered that "these simpler systems have to be studied in detail before the validity or otherwise of the rival points of view is established, and they serve as a guide to further work."

Titration curves of saturated solutions of cinnamic, isophthalic, and *p*-toluic acids, both in presence and absence of excess of the solid phase and for different times of interaction with the alkali, are given. "It has been shown that although excess of solid is present, evidence of only one dissociation constant is obtained, and that its value depends, as is to be expected, on the condition of interaction." The part played by traces of electrolytes present in colloidal aluminum hydroxide and its relation to the interpretation of titration curves are pointed out.

**The fluctuations of bacterial numbers and nitrate content of field soils,** H. G. Thornton and P. H. H. Gray (*Roy. Soc. [London], Proc., Ser. B, 106 (1930), No. B 746, pp. 399–417, figs. 17*).—In the investigation reported in this contribution from the Rothamsted Experimental Station, samples from a field soil were taken at 2-hour intervals, bacterial numbers were counted by plating, and the nitrate content was estimated. Fluctuations in bacterial numbers greatly exceeding the variation in bacterial content of simultaneous samples were found to occur by day and by night. A special plat was prepared by screening the soil, samples were taken from it at 2-hour intervals, and counts and nitrate determinations were made from two halves of the plat on each occasion of sampling. Fluctuations in bacterial numbers greatly exceeded the variation between simultaneous samples during the course of the day.

"A comparison of the variance between samples taken at different times of the day and that between simultaneous samples showed that the results could not be due to uneven distribution of bacteria over the plat. There is some evidence suggesting that different groups of bacteria show different fluctuations and that a portion of the population does not fluctuate. No correlation between the changes in bacterial numbers and soil moisture content could be found. In one series of daily counts, the fluctuations were correlated with rainfall. Soil temperature changes have rarely shown any relation to the fluctuations. Bacterial numbers have usually been high at 10 a. m. and low in the middle of the day. There is evidence suggesting that the nitrate content also fluctuates during the day."

**Some effects of intertillage on crops and soils,** F. G. Merkle and C. J. Irvin (*Pennsylvania Sta. Bul. 272 (1931), pp. 19, figs. 4*).—Measurement was made of the effect of intertillage upon yield, the moisture content of the soil, soil temperature, and nitrate production.

The moisture content of the soil was not increased by cultivation except in 1930, a result considered to indicate a tendency for the soil mulch to decrease evaporation. Many laboratory trials also confirmed this observation. Under the conditions usually prevailing during the summer months, however, there is so little mobile water in the subsoil and its capillary movement is so slow that these factors alone may be expected to limit evaporation. "Consequently, on upland soils with no water table in the soil mantle, as the Hagerstown silt loam on which these experiments were conducted, frequent cultivation may be expected not to decrease evaporation loss materially. It may on some other soils."

Nitrate production was shown not to be stimulated by frequent cultivation.

With respect to effects upon soil temperature, it was found that "loosening the surface produced a blanket of loose soil that acted like an insulation, causing the cultivated soil to be slightly cooler than the uncultivated soil. The difference is small but consistent." Of the experiments as a whole it is noted that "the results here reported consider the effects of cultivation during the summer months only. It is possible that tillage practiced early in the spring, while the soil has considerable moisture, may result in conserving this moisture."

The results confirmed, in general, for the soil and climatic conditions of Pennsylvania, the conclusions reached by the experimenters of other States, that the chief function of intertillage is to kill weeds and that cultivation should be frequent enough to keep weeds entirely under control.

**Soil fertility,** J. F. O'Kelly (*Mississippi Sta. Rpt. 1931, pp. 11–13*).—Fertilizer tests, for the most part of the usual type, have continued the work of the previous year (E. S. R., 64, p. 614) with closely similar results.

**Soil exhaustion: Its origin and the methods of combating it,** H. von Bronsart (*Bodenmüdigkeit, ihre Ursachen und Bekämpfung. Neudamm: J. Neumann, 1931, pp. [11]+83, figs. 9*).—This is a small monograph constituting the first of a projected series of the general title Wissenschaft und Technik des Gartenbaues (The Science and Technic of Horticulture). Following a general introductory chapter, the pamphlet takes up as its main subjects soil purification (complete and partial sterilization, effect of drying, etc.), soil purification by chemical means (various disinfectants and the use of lime), theoretical explanations of soil exhaustion, and the concept of soil exhaustion.

**[Soil investigations of the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 16, 17, 18, 19*).—The following items continue for the most part previous reports (E. S. R., 64, p. 617).

*The maintenance of organic matter in eastern Washington soils,* S. C. Vandecaveye and L. C. Wheeting.—Under continuous cropping, straw alone depressed winter wheat yields although alfalfa hay used alone increased the yields. Supplementing straw either with ammonium sulfate or with sodium nitrate overcame the depressing effect. Also, barnyard manure was followed consistently by increased yields. Over a 10-year period "the content of organic matter has been kept up successfully, but the quantity of annually available nitrogen has been low, due to lack of sufficient moisture to decompose the accumulated organic residues."

Under fallowing, excess amounts of nitrogen were apparently produced.

Bacteria and fungi were of major importance in the decomposition of the readily available carbonaceous materials. A distinct sequence of activity was noted, apparently dependent on the available food supply.

*Fertility investigations of Washington soils*, L. C. Wheeting and S. C. Vandecaveye.—Increases of from 14 to 20 bu. of wheat per acre were obtained from eroded hilltop soils from which the surface soil had been lost, with the exposure of a lighter colored subsoil, by applying calcium nitrate at the rate of 200 lbs. to the acre. Additional quantities of fertilizer did not further increase the yields.

*Changes occurring in the irrigated soils as a result of irrigation, cropping, and fertilizer treatments*, S. C. Vandecaveye and L. C. Wheeting.—"The reaction of the soil in the surface foot layer of the plats on the Ephrata fine sand in the Wenatchee area has changed markedly as a result of fertilizer applications. The plats treated with combinations of nitrogen and phosphate fertilizers and of nitrogen, phosphate, and potash fertilizers have changed from a slightly akaline to a slightly acid reaction, while those treated with phosphate and potash fertilizers without nitrogen have become more alkaline in reaction. Determinations of single or total exchangeable bases in the various plats of the Ephrata fine sand have shown that the quantity of exchangeable bases in this soil is small, and thus far either single or total exchangeable bases have not shown any significant relationship to the available plant nutrients in the soil or to crop yields."

*The effect of various factors on inoculation and nitrogen fixation*, S. C. Vandecaveye.—In a Palouse silt loam soil Azotobacter was found capable of rapid multiplication and of the fixation of much nitrogen when suitable organic residues were abundantly supplied. "The presence of average quantities of nitrate nitrogen in this soil does not seem to affect the nitrogen fixing power of Azotobacter."

**Chemical determinations of lime requirements and their correlation with field response**, J. K. Dixon (*New Zeal. Inst. Trans. and Proc., 62 (1931), pt. 2, pp. 67–79*).—This paper classifies methods for the measurement of lime requirement into the three groups, (1) those measuring lime absorption, (2) methods determining the available lime in the soil, and (3) indirect methods, such as electrometric or colorimetric pH measurements, determinations of replaceable hydrogen, the colorimetric test based on ferric thyocyanate, and Truog's (E. S. R., 43, p. 622) treatment with zinc sulfide suspension in calcium chloride solution; and presents the conclusions, in part, that "the work indicates that no single factor determination gives satisfactory evidence of field response. Since the acidity is caused by the hydrogen ion, and since lime can ameliorate its effect by reducing acidity, precipitating toxic iron, alumina (possibly), and manganese, liberating phosphates, flocculating clays, and promoting bacterial activity, it is reasonable to suppose that the ratio $H^+$ to $Ca^{++}$ indicates the soil status with regard to lime. . . .

"The correlation between laboratory methods and field results must remain at the moment qualitative rather than quantitative, since the agricultural evidence on the effect of lime is based on methods that do not give quantitative results. Until more reliable field trials—such as sheep weights—are introduced, a more rigid examination can not be made of the chemical methods."

**Phosphate solubility studies on some unproductive calcareous soils**, W. T. McGeorge and J. F. Breazeale (*Arizona Sta. Tech. Bul. 35 (1931), pp. 319–360, figs. 12*).—Numerous areas in otherwise productive fields of calcareous soils in Arizona were observed to yield but poorly or not at all; there was found to be no relation between the infertility of these unproductive areas and their "alkali" contents; and they could be reclaimed either by leaching or by treatment with phosphates. These soils were found well supplied with phosphate, but the phosphate soluble in water was shown to be low, some of the areas examined yielding quantities of water-soluble phosphate so small that they could not be determined colorimetrically.

"Grinding calcareous soils reduced the solubility of phosphate in water. Leaching soils with water and determining the phosphate concentration of successive leachings is a good method for determining the resolution velocity and therefore availability of phosphate, but is too slow an operation for a routine laboratory method. The presence of soluble salts in the soil solution or extract depresses phosphate solubility.

"In the colorimetric determination of phosphate, cloudy soil extracts are difficult to read accurately. Salts can not . . . be used to aid clarification or filtration without materially reducing solubility. Phosphate solubility in soils is best determined in water extracts by refiltering the extract through the mat of soil until clear.

"The concentration of phosphate in a water extract decreases with increase in soil: water ratio. If $CO_2$-saturated water is used the solubility increases with increase in soil: water ratio for most of the phosphate-deficient soils and decreases for the soils not deficient in phosphate. Carbon dioxide is the most suitable aid for clarifying soil extracts in solubility studies. On account of the variability in activity of soil calcium carbonate, a small amount of finely divided calcium carbonate should be added to the soils before extracting with $CO_2$-saturated water if uniform results are to be obtained. There is a close agreement between the good and poor classification and solubility of phosphate in successive extracts of soils to which calcium carbonate is added when they are extracted with $CO_2$-saturated water.

"The relative solubility of phosphate in good and poor soils may be shown by subjecting the soils to electrodialysis and determining the phosphate concentration of the anode chamber. In interpreting the data, however, allowance must be made for the clay content and soluble salts present in the soil.

"Practically all the soils showed response to phosphate when planted to tomatoes and millet, short growing crops which react readily to phosphate deficiencies in soils. The plants responding to phosphate fertilization also show an increase in absorption as measured by a quantitative determination of phosphate in the plant."

**The relation of phosphate availability, soil permeability, and carbon dioxide to the fertility of calcareous soils,** W. T. McGeorge and J. F. Breazeale (*Arizona Sta. Tech. Bul. 36 (1931), pp. 361–412, figs. 9*).—With reference to the effect of carbon dioxide on the solubility of phosphates in the soil, carbon dioxide derived from incorporated organic matter in the soil was found not to increase measurably the phosphate solubility in the soils under study, during short experimental periods. In some calcareous soils of very low phosphate availability, solubility of phosphate was less in $CO_2$-saturated water than in water free from carbon dioxide. Where phosphate availability was found good, $CO_2$-saturated water showed phosphate solubility equal to or better than that in $CO_2$-free water. "Solubility of phosphate in phosphate rock is greatly increased by the presence of any amount of carbon dioxide in the water." Fixation of dissolved phosphate by soils was found greater in the presence of $CO_2$-saturated water than in that of $CO_2$-free water. On leaching such soils the phosphate fixed in the presence of carbon dioxide was more soluble than that fixed in the absence of carbon dioxide.

To increase measurably the solubility of phosphates in calcareous soils, carbon dioxide required to be present in quantities sufficient to reduce the reaction below neutrality or to approximately pH 6.2–6.4.

Concerning the more direct effect of the soil carbon dioxide upon the plant, it is stated that the compound showed rather closely defined ranges of toxic and nontoxic concentrations, these varying with such environmental factors as, for example, the presence of calcium carbonate. "Toxic concentrations of carbon dioxide destroy the root enzymes, stop root elongation, and while the root itself is not killed, absorption of phosphorus is completely checked."

Leaching was found to increase the fertility of impermeable soils in which phosphate deficiency is important, improving the mechanical condition and thereby the range and respiration of the roots, and preventing, by aeration, the growth of anaerobic organisms and the reduction of the oxygen supply without which carbon dioxide, in the absence of which phosphate solubility is at a minimum, can not long be maintained.

With reference to the effect upon soil phosphate availability of the composition of the base-exchange complex, it is noted that "black alkali soils, that is, those with sufficient replaceable sodium to yield free hydroxyl ions on hydrolysis, always contain soluble phosphate in readily determinable amounts but the high alkalinity interferes with its assimilation by plants"; that "a calcium-saturated exchange complex reduces the solubility of phosphate by supplying the common ion calcium on hydrolysis, but in the presence of free carbon dioxide the reduction will not be of serious magnitude"; and that "if black alkali soils are leached free from replaceable sodium the phosphate solubility is reduced." The pH range of greatest phosphate insolubility appeared to lie between pH 8 and 8.5.

Salts of monovalent bases were found to decrease the solubility of soil phosphates by increasing the solubility of calcium. These compounds reduced also the absorption of phosphate by plants. Calcium carbonate in the solid phase was found capable of lowering the phosphate content of soils or of rock phosphate "to the merest traces or to nil." Soil phosphate of low availability was found to exist in the form of a double salt of 1 molecule of calcium carbonate combined with 3 molecules of tricalcium phosphate.

**Observations on the use of commercial fertilizers on the arid soils of Utah, D. W. Pittman and C. Burnham** (*Utah Sta. Bul. 233 (1932), pp. 24, figs. 3*).—The bulletin is in two parts, of which the first reports field fertilizer trials and some laboratory tests and the second is a general, more or less popular discussion of commercial fertilizers, their nature, purchase, manner of application, and immediate and residual effect. An appendix lists the field experiments and their results.

Of the experimental work some of the conclusions were that the best indicator of fertilizer needs is the field strip test, the laboratory methods being regarded as not wholly satisfactory, though of value if carefully interpreted; that the primary plant food elements should be tried first singly, then in combinations of others with that showing the most distinct response; and that in many Utah soils manuring may effectively replace any fertilizer by reason of the presence in the soil of much nonavailable phosphate capable of being brought into action by the manuring, which itself supplies such nitrogen and potassium as may be required. The Winogradsky test as used by the Colorado Station (E. S. R., 66, p. 616) is regarded as satisfactory for the detection of phosphate and lime deficiencies, but as of little use in testing for potassium requirements.

## AGRICULTURAL BOTANY

**Plant succession and grazing capacity on clay soils in southern New Mexico, R. S. Campbell** (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 12, pp. 1027–1051, figs. 7*).—Of various factors, namely, drought, overgrazing, erosion by wind and water, and rodent activities concerned in range depletion, grazing is said to be the most easily regulated. Since artificial reseeding with native forage plants, though potentially possible on limited areas, would be a costly procedure on large semidesert ranges, the author suggests that maintenance of a good stand of forage through conservative grazing is wiser than to attempt to restore overgrazed ranges by such seeding.

The occurrence and plant composition of each stage in the plant succession is said to be determined largely by the type of soil and its associated habitat factors. On clay soils, the *Scleropogon brevifolius* association is the first grass type of real forage value to become established and possesses the ability to endure several years of below-average rainfall. Scleropogon spreads chiefly by stolons, which make their most rapid growth during the summer rainy period. *Hilaria mutica*, a sod grass which spreads mainly by rhizomes, comprises a large proportion of the climax stage on all clay soil types. This grass at maturity becomes coarse and unpalatable and is at its best in summer. The climax stage in which Hilaria predominates is conceded the most productive of forage. A grazing program which would restrict grazing to the clay soil types in summer, and to the sandy and gravelly soil types in fall, winter, and spring, is suggested as desirable.

Four main stages of succession, (1) algae and lichens, (2) a localized ruderal-weed association, (3) Scleropogon association, and (4) *H. mutica* association, occurred on adobe soils. In the second stage there often appear dense stands of *Drymaria holosteoides*, a herb poisonous to livestock. On gravelly clay loams *Flourensia cernua*, a shrubby composite, is prominent in the climax, while on sandy clays the climax is a mixed grass association with *H. mutica*, *S. brevifolius*, and *Sporobolus* spp. predominating.

In conclusion, the author points out the desirability of determining the actual grazing capacity of each range unit together with the best season for its use.

**Physico-chemical studies on the nature of drought resistance in crop plants,** R. NEWTON and W. M. MARTIN (*Canad. Jour. Research, 3 (1930), Nos. 4, pp. 336–383, figs. 13; 5, pp. 385–427, pls. 4, figs. 6*).—The authors report studies carried on during 1924–1926, particularizing under the headings review of literature (55 titles listed), bound water as a measure of hydrophilic colloids, application of bound-water method to plant-tissue fluids, dialysis of plant juice and properties of dialysed fluids, properties of plant-tissue fluids in relation to drought resistance, and experiments with plant tissues, and supplying tabulations, curves, discussions, and summaries of the findings, with a summary.

Factors affecting drought resistance include those concerned in absorption, transpiration, and wilt endurance. The colloidal properties of leaf-tissue fluids are believed to be important in water retention under drought conditions. These and other physicochemical properties have been determined for cereals, grasses, and other plants in relation with known drought adaptations. Methods have also been investigated for the study of colloidal properties.

Hydrophilic colloids bind water and increase the concentration of aqueous solutions. Concentration, quality, and state of dispersion or coagulation of colloids are factors affecting the degree of water binding. Methods are described.

Osmotic pressure in the tissue fluids of crop plants varies with the physiological scarcity of water, but does not constitute a reliable index of drought resistance, bound-water content being apparently more dependable. The method of measuring imbibition pressure by direct pressure on masses of leaves proved unsuitable. The rates of water loss due to evaporation from cactus segments and from detached leaves of two grasses under controlled humidity conditions proved the remarkable capability of the cactus to retain moisture, but showed in the grasses no relation to drought resistance.

**Chlorophyll photosynthesis** [trans. title], G. Pollacci and M. Bergamaschi (*Atti Ist. Bot. R. Univ. Pavia, 4. ser., 1 (1929), pp. 157–160*).—This account purports to outline the demonstration, by use of dimethylhydroresorcinol, of the formation of formic aldehyde in living plants during chlorophyll synthesis.

**The middle lamella of the plant cell** [trans. title], J. Gregor (*Biol. Gen., 4 (1928), No. 3–5, pp. 377–386, figs. 4*).—In view of an alleged lack of clearness and unity in the current use of the terms middle lamella (Mittellamelle) and primary membrane (Primärmembran) as applied in description and discussion of plant cells, the author reviews the usages of several writers, giving quotations from Haberlandt, Meyer, Molisch, Strassburger-Koernicke, Reimers, Wiesner-Linsbauer, and Wisselingh, contributing his own synthesis of what he considers the most acceptable usage.

**Researches on the chemistry and physiology of tropical plants.—Analytical studies into the dynamics of carbohydrate-nitrogen flux in the vegetative and the reproductive organs of Artocarpus integrifolia**, B. N. Singh, K. Prasad, and R. N. Pande (*Indian Sci. Cong. Proc.* [*Calcutta*], *17 (1930), p. 311*).—A study of *A. integrifolia* leaves, assuming that the nature of the food products in the vegetative organs determines largely the initiation and development of the fruit and dealing analytically with the various carbohydrates and amino acids in the four stages of developmental phases here arbitrarily delimited, shows, as explained, that what is designated as the young stage has a high carbohydrate: nitrogen value in both the vegetative and the reproductive organs; the adolescent stage, a continuation of the same high ratio; the presenescent stage, a high carbohydrate: nitrogen and a low amino: mono ratio; and the full senescent phase, showing a high carbohydrate: nitrogen and a low amino: mono value in the leaves and a low carbohydrate: nitrogen and a low amino: mono ratio in the fruit.

**Observations on nitrogen metabolism in the leaves of Vitis and Rheum**, H. L. Newby and W. H. Pearsall (*Leeds Phil. and Lit. Soc. Proc., 2 (1930), No. 2. pp. 81–85*).—The protein: soluble nitrogen ratio in leaves of *V. vinifera* and *R. rhaponticum* changes with the age of the leaf, increasing with a fall in the water content. Diurnal fluctuations in this ratio are correlated with changes in acidity, increases in which are associated with increases in the proportion of protein.

**Absorption of carbon dioxide by plant roots** [trans. title], M. Bergamaschi (*Atti Ist. Bot. R. Univ. Pavia, 4. ser., 1 (1929), pp. 89–94, 117–149, figs. 6*).—In the first of these accounts, which is preliminary in character, the author states that in her work following up that of Pollacci (E. S. R., 38, p. 329) with plants grown in an atmosphere deprived of carbon dioxide but having their roots in nutritive media or soil rich in carbon dioxide, starch grains were formed by *Acer pseudoplatanus*, *Nerium oleander*, *Alisma plantago*, *Camellia thea*, and *Tilia europaea*. This broad conclusion is particularized.

The second report, which is more elaborate and more detailed as to its conclusions, states in general that plants assimilate, at least in part, carbon dioxide absorbed by the roots.

**Studies in the respiration of tropical plants.—Effect of injecting water, glucose, and phosphates on a failing system of respiration in the Artocarpus integrifolia leaves, and its significance on the mechanism of respiration**, B. N. Singh and K. V. Varadpande (*Indian Sci. Cong. Proc.* [*Calcutta*], *17 (1930), pp. 311, 312*).—Studies were made on the effects of injecting water, glucose, and phosphates into detached leaves of *A. integrifolia* at different temperatures.

Insufficiency of water lowers respiration. Sugar concentration may be so elevated that respiration fails entirely. Injection of 2 per cent glucose solution into the leaves brings about an increase of carbon dioxide output only at low temperatures. In starved leaves no extra output of carbon dioxide occurs even after injecting glucose solution at the various experimental temperatures. Supposedly, either starvation or high temperature brings about some alteration of the mechanism. Supplying glucose or admitting light will have similar effects.

When either water or glucose supply fails to enhance respiration, phosphate in minute doses has a marked effect in the production of carbon dioxide at low and medium temperatures but not at higher temperatures.

**On the response of the root of gram seedlings to electricity,** T. C. N. SINGH (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *pp. 312, 313*).—In a study of gram seedlings in garden soil and in nutritive solution, both media being under electrification, it was found that the root system alone was significally modified. The roots of the controls were very profuse, the secondary roots long and slender, and tertiary rootlets absent. The root system of the plants in electrified media was quite stunted, and the secondary roots were normal in number but stouter and provided with a number of small tertiary rootlets. The total root length of the control as compared with that of the electrified plant was 1:2.

**Absorptivity in seeds of Trifolium pratense** [trans. title], J. STEPHAN (*Landw. Vers. Sta.*, *108* (*1929*), *No. 5–6, p. 371–376*).—Neither color nor size seems to be significantly correlated with absorptivity in seeds of *T. pratense.*

**The effect of increase of dosage of calcium sulfite and calcium sulfate on germination and early development of cereal plants** [trans. title], K. SCHARRER and W. SCHROPP (*Landw. Vers. Sta.*, *108* (*1929*), *No. 3–4, pp. 217–251, figs. 36*).—The effect of even the smaller calcium sulfite additions to loam soils was to give, without loss to germination, greater or less increase of green weight to rye, wheat, and barley, but a slight depression of germination and of yield in case of oats. Calcium sulfate in fairly large dosage was clearly unfavorable to winter rye, winter barley, and oats, least so in case of wheat. The smaller additions gave varied results. In low peaty soils both sulfite and sulfate gave lowered yields, this tendency being marked in case of winter wheat, winter rye, and oats. In winter barley, the slight additions of calcium sulfite were better than the large additions, while the smallest additions of calcium sulfate caused large crop losses. No clear relation between the pH values in the various soils to yield could be made out.

**Growth inhibition of potato sprouts by the volatile products of apples,** O. H. ELMER (*Science*, *75* (*1932*), *No. 1937, p. 193*).—The author reports that volatile substances from ripe apples were found to inhibit the normal sprout development of germinating potatoes. Inhibited growth due to the volatile products from four varieties of apple fruits was observed with six varieties of potatoes.

No growth inhibition resulted from the volatile substances of oranges, bananas, decayed apples, or from isoamyl valerate. Immature apples did not produce normal growth arrestment, but these same fruits after ripening did so. A single test with Kieffer pear fruits showed inhibition similar to that produced from ripe apple fruits.

The effect of the volatile products of apples was found to be transitory, normal sprout development taking place after potatoes were removed from their influence. In a preliminary test, potato tubers stored with apples in closed containers until June remained firmer and of better quality than did the control tubers.

**Breaking the dormancy of tree seedlings by chemical treatment,** W. C. Bramble (*Science, 75 (1932), No. 1937, pp. 193, 194*).—In a previous publication (E. S. R., 62, p. 618), Deuber and Bowen reported the breaking of the rest period of sugar maple seedlings with ethylene chlorohydrin.

By following this method of treatment the author was able to break the rest period of sugar maple and chestnut seedlings, exposing them for 3 days to the vapors from 25 cc of ethylene chlorohydrin diffused in 450 liters of air space. In the case of chestnut seedlings exposed for 4 days to the vapor, there was some killing of the tips of the upper branches. While this treatment seems to be toxic to young branches at higher concentrations, when properly regulated it has proved to be very useful for breaking the rest period of both sugar maple and chestnut seedlings.

**Germination of cotton pollen in artificial culture media** [trans. title], T. Shibuya (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 2 (1930), No. 1, pp. 55–64; Eng. abs., pp. 63, 64*).—In experimentation carried out in 1929, chiefly from a physiological point of view on the germination of sea island cotton pollen, it was found that with sucrose solutions of ranging concentrations used in the moist chamber methods with the Van Tieghem cell, the bursting limit in various concentrations for pollen grains was reached in the neighborhood of 70 per cent. The most favorable culture medium concentration for pollen germination and for tube growth is attained by use of 35 per cent sucrose plus 5 per cent agar or 40 per cent sucrose plus 4 per cent agar. With the latter, the highest germination rate occurred at 25° C., no germination occurring at 40° on account of bursting or at 15° on account of quiescence. The greatest pollen tube growth occurred at 35°. The optimum range for pollen germination and pollen tube growth lay between pH 6.5 and 6.1, with slight increases at pH 5 and 7.6 and very slight germination at pH 3.6.

**Studies in the physiology of sandal (Santalum album Linn.), Part I,** Y. V. S. Rao and M. Sreenivasaya (*Indian Sci. Cong. Proc.* [*Calcutta*], *17 (1930), p. 314*).—Control cultures of sandal (*S. album*) have shown that without a host sandal is able to continue a struggling existence, and that some hosts nourish sandal better than others. Sandal deprived of host connection ceases visible growth, the leaves becoming abnormal in spite of any provision of rich soil. If a host, more especially of the leguminous type, be provided, the sandal in two or three weeks starts to grow, the pale leaves turn green, and a healthy appearance is resumed.

That sandal is a root parasite is said to have been established by J. Scott in 1871, but the nature and extent of its parasitism has never been fully worked out from a biochemical viewpoint, though it is known from experiments that sandal depends largely upon its hosts for nitrogen and phosphorus. Sandal also exhibits preference for certain host types as regards its haustorical attachments.

**An apparatus for growing plants under controlled environmental conditions,** R. A. Steinberg (*Jour. Agr. Research* [*U. S.*], *43 (1931), No. 12, pp. 1071–1084, figs. 8*).—Stating that of several environmental conditions light has proved the most difficult to control, the author describes an apparatus comprised of eight light cases in which the lighting units are immersed in water and which provides for the control of light intensity to within a total error of less than ±10 per cent and of light quality to within a color-temperature variation of ±100° *K*, according to the duration of the lamp burn. Temperature is regulated to within an error of ±0.5° F., humidity to within an error of ±0.5 per cent, and soil moisture to within an error of ±1 per cent.

## GENETICS

**Introduction to cytology,** L. W. Sharp (*Einführung in die Zytologie. Berlin: Borntraeger Bros., 1931, pp. 733, figs. 212*).—This edition of the work previously noted (E. S. R., 55, p. 730) is said to have been translated and elaborated by R. Jeretzky to supply the need for such work in German-speaking regions. Points of view and advances are indicated, and the literature list has been extended.

**The meiotic divisions in the pollen mother-cells of Malva sylvestris,** J. Latter (*Ann. Bot. [London], 46 (1932), No. 181, pp. 1–10, pls. 2*).—These divisions are described.

**The reduction divisions in the Boskoop apple** [trans. title], E. Elssmann and R. von Veh (*Gartenbauwissenschaft, 6 (1931), No. 1, pp. 1–54, figs. 20*).—Accompanied by a bibliography of 778 references, a discussion, illustrated with microphotographs, is presented upon megasporogenesis in the Boskoop apple. The female primary archespore cell was evident at a very early stage in the development of the ovule, namely, in the nucellus without an integument. The egg cell of the Boskoop apple was haploid. The tetrad consisted of a one-celled macrospore and three degenerated sister cells.

**Lethal gene-combinations and pollen sterility in diploid apple varieties: A critique and a theory,** O. Heilborn (*Hereditas, 16 (1932), No. 1–2, pp. 1–18, figs. 2*).—Observations on chromosome conjugation and pollen sterility of dwarf apples grown one year in a heated greenhouse and the next year in the open indicated that the reduction divisions as well as the fertility of the pollen are but little influenced by such changes in environment. The differences between apple varieties, as regarded pollen fertility, appeared to be constant from year to year. The author suggests that comparisons of pollen viability in diploid apple varieties should make allowance for the abortive grains characteristic of each variety and which can not under any circumstances be expected to germinate. Such sterility has a genetic basis, and is deemed to be to a high degree independent of climatic or nutritional conditions and to depend rather on certain lethal gene combinations present in some varieties and absent in others.

**Self-sterility,** E. M. East (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1929, vol. 5, pp. 331–370*).—This article presents general observations on self-sterility, the genetics of self-sterility, the relation between self-sterility and self-fertility, the physiology of self-sterility, the origin of self-sterile lines, and self-sterility in animals, with a literature list of 152 titles.

**Study on the new type of sterility in rice,** H. S. Singh (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), p. 312*).—The author systematically details, with discussion, the replacement of flowers by hairlike structures in the rice plant and other peculiarities or abnormalities.

**A cytological study of the genus Sorghum Pers.—I, The somatic chromosomes,** C. L. Huskins and S. G. Smith (*Jour. Genetics, 25 (1932), No. 2, pp. 241–249, figs. 25*).—Chromosome counts in a number of sorghums showed the somatic number of Johnson grass to be 40 and of other grain and grass sorghums studied to be 20. A number of tetraploid segments and one octoploid segment were found in root tips of diploid plants, and in one tetraploid cell the chromosomes were paired closely. One peculiarly shaped chromosome could be identified in all the species examined. It was present only in duplicate in the tetraploid *S. halepense.*

**Chromosome number in the genus Cucurbita,** M. L. Ruttle (Mrs. Nebel) (*New York State Sta. Tech. Bul. 186 (1931), pp. 12, figs. 10*).—Despite an earlier report of 24 haploid and 48 diploid chromosomes in *C. moschata,* the author found 20 haploid and 40 diploid chromosomes in all material examined, namely, 4 varieties of *C. moschata*, 7 varieties of *C. pepo*, and 1 of *C. maxima*. The presence in the root tip nuclei of long chromosomes with pronounced median constrictions and also of satellited chromosomes made accurate counts rather difficult. No secondary pairing was observed in Cucurbita, suggesting that in this genus a secondary balance has been attained that is so perfect that phylogenetic relationships of groups of chromosomes, if they once existed, have now disappeared.

Measurements showed that the diameter of the Cucurbita microsporocyte is approximately eight times that of its nucleus as compared with ratios of approximately 2:1 and 3:1, respectively, in the Red Astrachan apple and certain mints. The results suggest that it is impossible to distinguish between the three species on the basis of chromosome counts.

**Fruit size and shape genes on the first chromosome of the tomato,** E. W. Lindstrom (*Iowa Acad. Sci. Proc., 36 (1929), pp. 189, 190*).—As computed at the Iowa Experiment Station, the coefficients of correlation between fruit size and fruit shape in two $F_2$ tomato populations, namely, Yellow Cherry×Dwarf Pear and Red Currant×medium ovate, were, respectively,—0.45±0.04 and —0.31 ±0.05, suggesting that larger size can be associated with ovate shape and small size with round or oblate shape and that the correlation between shape and size in tomato fruits is based on a genetic linkage. The possibility of developing very large ovate shaped tomatoes by genetic recombination is conceded.

**New cases of chromosomal linkage in Pisum** [trans. title], A. Håkansson (*Hereditas, 16 (1932), No. 1-2, pp. 155-159, figs. 7*).—Three instances of linking of the chromosomes are illustrated and discussed with relation to their effect on sterility, etc.

**A theory on the cytologically irregular species Viola canina L.,** H. G. Bruun (*Hereditas, 16 (1932), No. 1-2, pp. 63-72, figs. 2*).—Working at the Botanical Institute at Uppsala, Sweden, upon the somatic chromosome constitution of a wild population of pure *V. canina*, the author found no irregularities of extra chromosomes or fragments, all plants having 40 diploid chromosomes. He proposes a theory to account for cytological irregularities observed by others in Viola and other genera on the basis of intraspecific crosses between balanced races differing in chromosome organization. Conforming to this theory, balanced races should exist, and such is believed to be the case of the Viola population examined.

**Cytology of hybrids,** H. C. Aase (*Wash. State Col., Research Studies, 2 (1930), No. 1, pp. 60, figs. 27*).—This is a detailed account of the author's study on the cytology of Triticum, Secale, and Aegilops hybrids with reference to phylogeny, the hybridizations for which were accomplished in the cereal nursery of the Washington Experiment Station. The cytological account is limited to the meiotic phases in the pollen mother cells and embryo sac mother cells of $F_1$ hybrids and in some cases their parents. The hybrids are for convenience grouped according to their somatic chromosome number as triploids, tetraploids, and pentaploids, the hexaploid wheats being in general referred to as vulgare or the vulgare group, the tetraploid wheats as emmer or the emmer group, and the diploid wheats as einkorn or the einkorn group. The work is presented in tabular detail, with conclusions and discussion thereof.

**Brassica napocampestris, a new constant amphidiploid species hybrid,** H. N. Frandsen and Ö. Winge (*Hereditas, 16 (1932), No. 1-2 pp. 212-218*).—Reciprocal crosses between the Lyngby Bangholm swede (*B. napus*) and the Yellow Tankard turnip (*B. campestris*) were successful in three instances. From this seed were grown 47, 48, and 66 $F_1$ plants mostly intermediate in type.

In the $F_2$ there was a very pronounced segregation with more marked resemblance to the swede than to the turnip parent. One line was unusually uniform, all the roots being green topped and of a slight reddish hue. Determinations of the chromosomes in the root tip cells of this lot showed 56, the sum of those of the parental species. The same number was recorded in the $F_1$ and $F_2$ of this strain, indicating the origin of a new amphidiploid constant breeding form here designated as *B. napocampestris*.

**Results from a cross between cabbage and Savoy cabbage,** J. Rasmusson (*Hereditas, 16 (1932), No. 1-2, pp. 241–248*).—Observations on the $F_1$ generation of crosses between standard type cabbage and Savoy showed a dominance of Savoy wrinkledness, but most characters, including waxiness, solidity of head, flavor, and keeping quality, were intermediate. In weight the $F_1$ heads were larger than either parent. Segregation in the $F_2$ was quantitative and fairly complicated, and none of the $F_2$ plants had the pronounced cabbage flavor of the original cabbage parent. It was obvious that inbreeding of a vigorous $F_1$ population had resulted in a weaker stock, and the $F_3$ was even less worthy as breeding material.

**Inheritance phenomena in fungi** [trans. title], H. Kniep (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1929, vol. 5, pp. 371–478, figs. 15*).—This is a systematic historical account, the alphabetically listed literature of which dates back as early as 1896.

**Inheritance of seed coat color in Phaseolus** [trans. title], H. Lamprecht (*Hereditas, 16 (1932), No. 1–2, pp. 169–211*).—Stating that earlier workers failed in most cases to describe accurately the colors observed, the author presents in detail color segregation observed at the Vegetable Research Station at Alnarp, Sweden, through the $F_3$ generation and analyzes the results genetically.

**Inbreeding, with particular reference to maize,** R. J. Garber (*Jour. Amer. Soc. Agron., 23 (1931), No. 7, pp. 534–548*).—Methods of inbreeding corn used rather generally by technical breeders seeking to improve yield in corn are discussed, and some of the results of economic significance already attained are cited. Data from an inbreeding experiment carried on for 10 years at the West Virginia Experiment Station showed that inbred strains of corn isolated by self-pollination differed considerably in degree of susceptibility to smut, and some of them showed consistent differences with respect to place of infection.

**Brown midrib in maize and its linkage relations,** L. R. Jorgenson (*Jour. Amer. Soc. Agron., 23 (1931), No. 7, pp. 549–577*).—The pigment characterizing brown midrib (*Bm bm*) in corn, according to Minnesota Experiment Station studies, was located in the lignified tissue of the entire plant. Its formation began after lignified tissue was formed and while cell organization was complete. It was not observed in the cytoplasm of the cell, and was either a compound of lignin or was laid down in the interstices of the lignified tissue and could not be separated from it. It evidently was not carotene, xanthophyll, tannin, anthocyanin, or a flavone or flavonal pigment, and was not produced in the dark. The juices extracted from brown midrib plants grown in the greenhouse were slightly less acid than comparable normal plants, the osmotic pressure of the juices was about 0.5 atmosphere higher in the normal plants at the 10- to 12-leaf stage, and the electrical conductivity was slightly higher.

The character was inherited as a simple Mendelian recessive. *Bm bm* was inherited independently of the *C-Wx*, *R-G*$_1$, *Su-Tu*, *B-Lg*, *Y-Pl*, *P-Br*, *Ra-Gl*$_1$ and *A-Ts*$_1$ linkage groups, and of the *Jj*, *Ww*, and *Pg*$_2$ *pg*$_2$ factor pairs. It was linked with the *Pr pr* factor pair of the *Pr-V*$_2$ linkage group. Crossover percentages obtained in three crosses were 26.3±1.8, 28.3±1.2, and 28.8±2.6.

**Breeding and inheritance studies for poultry breeders,** O. Bartsch (*Züchtungs- und Vererbungslehre für Geflügelzüchter. Berlin: Fritz Pfenningstorff, 1929, 2. ed., rev. and enl., pp. VIII+208, figs. 116*).—This gives an account of the known hereditary factors in poultry and their mode of transmission.

**Domestic breed production by mutations on the descendants of Ovis vignei Blyth** [trans. title], L. Adametz (*Ztschr. Zücht., Reihe B, Tierzücht. u. Zuchtungsbiol., 20 (1930), No. 1, pp. 1–23, figs. 14*).—Attention is called to the numerous mutations in ear, horn, tail, and wool characters and their importance in the formation of sheep breeds.

**The morphology and inheritance of dominant and recessive spotting as well as the glass-eyed condition in the horse** [trans. title], V. Klemola (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 20 (1930), No. 1, pp. 24–78, figs.* [55]).—A dominant spotting, which is more common in horses from middle Europe and in ponies, and a recessive spotting occurring in heavy horses of northern Europe are described. The glass eye factor behaves as a dominant to recessive spotting, but is recessive to the solid color.

**Early instances of fertile mules,** J. Baashuus-Jessen (*Jour. Heredity, 21 (1930), No. 9, pp. 407, 408, fig. 1*).—Brief notes on early instances of fertile mules and the superstition connected therewith.

**Hybrid vigor—a factor in tettigid parthenogenesis,** W. R. B. Robertson (*Amer. Nat., 65 (1931), No. 697, pp. 165–172*).—A discussion of cytological aspects of parthenogenesis in the Tettigidae, based on studies conducted at the Kansas Experiment Station.

**Changes in the ovary and oestrus cycle following the removal of one ovary in albino rats,** F. E. Emery (*Physiol. Zool., 4 (1931), No. 1, pp. 101–110*).—It was found that the oestrous cycles of 100 semiovariotomized rats were longer in duration and more irregular than the cycles in 100 normal females. The cornified cells in the vaginal smears continued for more than 5 days in 46 per cent of the operated females, with practically none continuing for more than 5 days in the unoperated animals. In the semiovariotomized animals the remaining ovary hypertrophied and many corpora lutea and large follicles were present, as were also large cysts.

**The relation between the anterior pituitary body and the gonads.—Part III, Fractionation and dilution of ovary-stimulating extracts,** M. Hill and A. S. Parkes (*Roy. Soc. [London], Proc., Ser. B, 107 (1931), No. B 753, pp. 455–463, pls. 2*).—Continuing this series (E. S. R., 65, p. 29), in experiments with mice, rats, rabbits, and ferrets, saline suspensions of pituitary tissue and extracts of the urine of pregnancy produced follicular luteinization and formation of atresic corpora lutea without ovulation, and normal follicular maturation and ovulation, in one or more of the species of test animals used. The complete failure of the extensive dilution experiments with urine extracts indicated that the two reactions could not be ascribed to the activity of one stimulating hormone evoking the different responses in different concentrations. Some progress in separating the luteinizing and maturing activity was made with alcohol fractions of urine extracts.

**An analysis of the developing metanephros in mouse embryos with abnormal kidneys,** A. L. Brown (*Amer. Jour. Anat., 47 (1931), No. 1, pp. 117–171, pls. 6, figs. 13*).—The development of the hereditary abnormal kidney condition supposedly induced by X-rays by Bagg and Little (E. S. R., 52, p. 131) is described from embryos studied anatomically and histologically from different stages of pregnancy.

**The influence of the thyroid gland on the pigmentation of fur in rabbits and in a Siamese cat** [trans. title], N. A. Iljin (*Züchtungskunde, 6 (1931),* *No. 8, pp. 304–308, figs. 2)*.—The results of these studies showed that the content of the hormone of the thyroid gland in the blood changed the quality of the hair in density, length, and color. The feeding of thyroid tablets to rabbits kept at a temperature of about 18 to 21° C. caused dark hair to come in white, with a lesser depigmentation at room temperature. Thyroidectomy resulted in a darkening of the hair. It appeared that there was an optimum amount of thyroid hormone which would produce the best quality fur. A reduced quantity of the hormone produced a desired dark color, but a lack of the hormone injured the quality of the fur.

**The winter pelage of the adult albino rat,** D. A. FRASER (*Amer. Jour. Anat., 47 (1931), No. 1, pp. 55–87, pl. 1, figs. 7*).—This deals with the different types of hair and the arrangement found on the albino rat, including the ratio of weight of pelage to body weight and surface.

**The sex ratio in the domestic fowl in relation to size of family,** M. A. JULL (*Poultry Sci., 10 (1931), No. 3, pp. 125–130*).—Data on the sex ratios of selected families in which more than 10 chicks were hatched, or were raised to an age at which they could be sexed, and on 18,936 chicks without regard to the number per family indicated no preferential mortality by sex from hatching to the fall of the year. The normal sex ratio was slightly under 50 per cent males in poultry.

## FIELD CROPS

**[Field crops work in Georgia, 1931]** (*Georgia Sta. Rpt. 1931, pp. 9–28, 40, 41, figs. 5*).—In a cross between Rustproof oats, with awned upper kernels, many basal hairs on lower kernels, and well developed sucker-mouth attachment of lower kernel, and Fulghum, with awnless upper kernel, few basal hairs, and modified sucker-mouth, the $F_2$ segregation approximated 3 awnless : 1 awned upper kernel and 3 Fulghum attachment of kernels : 1 Rustproof type, indicating single Mendelian factors in each case. Few basal hairs was dominant over many basal hairs, with probably three factors involved. There was a 100 per cent linkage between the Rustproof type of attachment, many basal hairs, and awned upper kernels when all upper kernels were awned.

Gasta wheat, a selection from Purplestraw, has given high yields and shown resistance to loose smut. This variety and Rustproof No. 174 oats showed small losses from shattering when harvesting was delayed and were considered good sorts for combine harvesting. Other breeding work included tests of wheat hybrids for immunity to leaf rust, tests of oats strains for yield and resistance to smut, and studies of hybrids between wheat and rye.

Limestone applied for cotton in the Piedmont section usually produced a profitable increase where the sources of nitrogen, such as ammonium sulfate, urea, ammonium phosphate, and diammonium phosphate, were acid forming. Its use in mixed fertilizers with alkali-forming nitrogen is not advised. Results in the Coastal Plain region showed a decrease from the use of limestone on the heavier soil types, as Orangeburg sandy loam and Carnegie sandy loam. Both increases and no advantages were obtained on Norfolk sandy loam. With the limited data it did not seem advisable to use limestone for cotton on Coastal Plain soils. Other cotton experiments were comparisons of ammoniated and other phosphates, triangular fertilizer tests, a study of ammonia v. nitrate nitrogen for cotton (see p. 732), variety-date of planning tests, and a study of cotton marketing conditions.

**[Agronomic work in Mississippi, 1931]**, C. F. BRISCOE, W. E. AYRES, T. F. MCGEHEE, S. J. GREER, H. F. WALLACE, and J. C. ROBERT (*Mississippi Sta. Rpt. 1931, pp. 9–11, 16–21, 52–54, 56, 57, 58, 60–62, 66–70, 72, 73, 74–77*).—Experiments with field crops again reported on from the station and substations (E. S. R., 64, p. 623) included breeding work with corn, cotton, and soybeans; inheritance studies with corn and cotton; variety tests with cotton, corn, oats, grain sorghum, sorgo, peanuts, soybeans, alfalfa, lespedeza, field peas, winter cover crops, potatoes, sweetpotatoes, and sugarcane; cultural (including planting) trials with cotton, oats, and winter legumes; fertilizer tests with cotton, corn, oats, alfalfa, and potatoes; seed treatment of cotton; interplanting tests of corn with legumes; studies of the root tubercle bacteria of the soybean and cowpea groups; and crop rotations.

**[Field crops experiments in Washington]**, E. G. Schafer, O. E. Barbee, O. A. Vogel, E. F. Gaines, W. K. Smith, A. L. Hafenrichter, C. L. Vincent, E. L. Overholser, H. M. Wanser, H. D. Jacquot, H. P. Singleton, L. L. Claypool, and C. A. Larson (*Washington Col. Sta. Bul. 260 (1931), pp. 11–13, 14–16, 45, 46, 54, 55, 57–59, 63, 64, 65*).—Agronomic activities again reported on from the station and substations (E. S. R., 64, p. 626) comprised variety tests with spring and winter wheat, corn, oats, barley, rye, alfalfa, sweetclover, and forage grasses; breeding work with wheat and potatoes; fertilizer and storage tests with potatoes; soil fertility studies; weed control experiments, and crop rotations.

Competition between alfalfa and sweetclover as forage crops and cereals and grasses as companion crops was studied in cooperation with the U. S. Department of Agriculture. Yields of alfalfa and sweetclover hay in the second year were not correlated with stands in the fall of the first year or the spring of the second, but were related more directly to the relative vigor of the first-year plants as affected by different companion crops. Peas competed less with the forages than did the cereals, winter grains markedly reducing both stand and vigor. The seeding rate of the companion crop seemed less important in competition than the species. Cultural practices appeared to modify the degree and probably to influence the nature of competition.

In irrigation experiments with crops at the Irrigation Substation, high yields reported were from potatoes receiving 39 acre-in. of water, 10.7 tons with 78.6 per cent of No. 1's; alfalfa receiving 45.3 acre-in. of water, 7.2 tons; wheat receiving 38 acre-in. in five irrigations, 37.4 bu.; and corn 4 acre-in. every 15 days, 44.6 bu. Yields of alfalfa (up to 4 acre-ft. at monthly intervals) and of wheat were correlated with the amount of water applied, while potato yields were not, except in quality.

Sodium chlorate applied in late summer and early fall consistently was more effective in eradicating bindweed and other perennial weeds than when applied in early summer or midsummer. About 300 lbs. per acre is required for maximum control but is seldom wholly effective. When needed, a second application should be made the following year. Sodium chlorate proved more effective than other herbicides in chemically equivalent quantities. Applications exceeding 300 lbs. per acre affected adversely the physical condition of the soil, and this seemed to persist to some extent for two years after application. Residual toxicity was influenced by the quantity of chlorate used and soil variation, and some crops were more sensitive than others. Mixtures of sodium chlorate with magnesium chloride were better as to herbicidal power and reduced fire hazards than mixtures with other hygroscopic salts. No lethal effect was secured through the agency of the various hygroscopic salts.

**Irrigated crop rotations in western South Dakota**, S. H. Hastings and B. Aune (*U. S. Dept. Agr. Circ. 188 (1932), pp. 47, figs. 4*).—Crop rotation investigations conducted on the Belle Fourche, S. Dak., Field Station since 1912 and reported on to include 1929 were similar in scope and character to experiments near Huntley, Mont. (E. S. R., 62, p. 128) and Mitchell, Nebr. (E. S. R., 58, p. 30), begun at the same time and already reported on. The technic and environmental conditions and crop yields are described in some detail.

Annual fluctuations in yields expressed as percentages of the mean yield of all plats for each crop were for oats 48 per cent in 1929 to 167 per cent in 1915, sugar beets 68 in 1916 to 132 in 1925, potatoes 37 in 1912 to 161 in 1925, spring wheat 57 in 1916 and 1923 to 171 in 1914, and corn 71 per cent in 1927 to 122 per cent in 1923. The mean annual acre yields of oats, sugar beets, and potatoes demonstrated the extent of the decline to be expected in untreated rotations, the value of stable manure in increasing crop yields, and the fact that yields from rotations including alfalfa were but slightly more than maintained.

Oats gave highest yields for the last 6-year period from the 6-year alfalfa rotations, either manured or pastured, and from 2-year rotations receiving manure every second season. As a rule oats made better yields in rotations for the last 6 years when following potatoes instead of sugar beets. With sugar beets the most favorable results were from stable manure in 2-year rotations, with pastured alfalfa rotations second, and manured 3-year rotations third. Sugar beet yields just after oats, wheat, or corn were not so satisfactory as where potatoes preceded. Potato yields were stimulated by manure, the largest yields being harvested from rotations where manure was applied every third year. In most cases potato yields in alfalfa rotations were larger than those in untreated rotations but less than from those receiving manure. However, potato yields of alfalfa rotations tended definitely to increase as time went on. Corn yields were highest in a pastured sweetclover rotation and were high in pastured alfalfa rotations. Spring wheat outyielded winter wheat. It made slightly higher yields in a rotation including 2 years of alfalfa just before the wheat than where alternating with sugar beets. Alfalfa made its largest mean yields for both the first and second years from a wheat-oats combination including 2 years of alfalfa. The largest acre yield was obtained from continuous alfalfa which received manure annually.

The largest net returns were from the different rotations where pasturing was practiced or manure applied. From certain cropping systems, as sugar beets, oats, wheat, and potatoes continuously on the same land, substantial losses might be expected. When the returns from the first 6-year period were compared with the last 6-year period and differences in values were considered, all continuously cropped plats sustained losses, and the values of crops from untreated plats were scarcely maintained. The most substantial increase resulted from applications of manure. Alfalfa rotations, on the average, resulted in losses but increased in value when the last period was compared with the first.

**Hardiness studies with 2-year-old alfalfa plants,** G. L. PELTIER and H. M. TYSDAL (*Jour. Agr. Research [U. S.], 43 (1931), No. 11, pp. 931–955, figs. 5*).—Observations by the Nebraska Experiment Station and the U. S. Department of Agriculture on the development of alfalfa plants, after being frozen at temperatures of approximately —18° C. for various lengths of time at nine different dates, showed a much lower percentage of survival in all lots in early fall. In general, progressively higher percentages of survival were recorded in all alfalfas in late fall and early winter, suggesting that the hardening process is accumulative over a relatively long period. The hardy alfalfas apparently became dormant early and hardened more rapidly than did the tender varieties. On the other hand, control plants brought from the field and planted in the greenhouse showed a high percentage of survival from early fall until late winter, with mortality increasing in the April lot.

The moisture content of all alfalfas (roots and crown) decreased during fall, and in the hardy and mid-hardy kinds increased again in spring, but stayed low in the tender varieties during March and April.

Within a single variety, plants with the largest root diameters, with the greatest number of buds and stems, and in the best condition withstood artificial freezing most successfully. The rate of recovery of all alfalfas from artificial freezing and their subsequent growth were related directly to the extent of injuries present on the plants. All the alfalfas tested were susceptible to cold injury from artificial freezing.

**A physiological study of varietal differences in plants.—II, Further evidence for the differential response in yield of barley varieties to manurial deficiencies,** F. G. Gregory and F. Crowther (*Ann. Bot. [London], 45 (1931), No. 180, pp. 579–592, fig. 1*).—Further evidence (E. S. R., 59, p. 827) is presented for the existence of a differential response of barley varieties to various types of fertilization. The hybrid Plumage Archer and the parents Plumage and English Archer were grown on completely fertilized plats and on plats lacking in nitrogen, in phosphorus, and in potassium, 42 replicates of each variety being used for each treatment.

Under high fertility Plumage outyielded English Archer, whereas with low nitrogen and phosphorus English Archer excelled Plumage. With potash deficiency at harvest English Archer appeared to give a higher yield, although Plumage consistently led throughout the vegetative phase. Plumage Archer appeared to suffer more than either parent from phosphorus starvation, or at least to resemble closely Plumage in its phosphorus requirements. Under nitrogen starvation it resembled English Archer more closely. With deficiency of potash it appeared definitely to surpass either parent, whereas with complete fertilization it was intermediate. No clear relation was shown between the final yield and the amount of reserve nutrient in the seed.

**Local, domestic, and foreign-grown red clover seed,** R. G. Wiggans (*Jour. Amer. Soc. Agron., 23 (1931), No. 7, pp. 572–579, fig. 1*).—Further comparative tests with red clover strains (E. S. R., 59, p. 225) at Cornell University furnished more evidence of the existence of distinct strains produced not only in widely separated regions of diverse environmental conditions but also within regions that differ only slightly in the various factors. Possibilities of the discovery of adapted strains for various regions seem not to have been exhausted. There appeared to be inherent differences in red clover strains as to length of life and ability to survive severe winters.

The best method of making comparisons between strains of red clover and of other forage crops seemed to be on the dry-weight basis, the dry-weight percentage being determined from carefully secured and artificially dried shrinkage samples.

**A study of ammonia and nitrate nitrogen for cotton—I, Influence on absorption of other elements,** K. T. Holley, T. A. Pickett, and T. G. Dulin (*Georgia Sta. Bul. 169 (1931), pp. 14, figs. 3*).—Plants of Durango cotton grown in earthen jars produced more dry matter in nitrate nitrogen (potassium nitrate) solutions than in ammonia nitrogen (ammonium sulfate). Good growth was obtained in each case. While the plants receiving nitrate grew faster during the first two or three weeks, the difference in dry matter as compared with ammonia-fed plants was less at from five to six weeks than at other growth stages. Grown under unfavorable conditions during a 6-week period in a solution with a high concentration of nitrogen, ammonia-fed plants had very high nitrogen contents, while under favorable growing conditions with lower nitrogen concentration in the solutions the nitrate- and ammonia-fed plants at 13 weeks differed little in total nitrogen content of plants, but there was some variation in the nitrogen distribution in roots, stems, and leaves.

Use of the ammonium ion as a source of nitrogen reduced the absorption of bases, especially calcium and magnesium. This ion appeared to reduce calcium absorption, yet there was no evidence that calcium reduced the absorption of ammonia nitrogen. While differences in the calcium content of ammonia- and nitrate-fed plants were due largely to leaf calcium content, the differences in magnesium content were evident in roots, stems, and leaves. The ammonia-fed plants tended to absorb relatively more sulfur and phosphorus in the early growth stages, but in the later stages the nitrate-fed plants tended to absorb them slightly faster after fruiting started. The progress of the study has been noted earlier (E. S. R., 65, p. 123).

**Common errors in cotton production,** O. F. Cook (*U. S. Dept. Agr., Farmers' Bul. 1686 (1932), pp. II+26, figs. 3*).—The chief defects in cotton production in the United States are summarized, with constructive suggestions for improvement. General improvement measures include the production of single varieties on a community scale and a change in the method of buying cotton so as to give a higher return for better quality. Some causes of inferior cotton are planting poor seed, planting on price conjectures, changing the seed, planting too many varieties, failure to test varieties, misleading claims for varieties, propagating hybrids, unsuitable land, planting or thinning too early, spacing too wide, picking too late, breeding weevils in the fall, mixing the seed at public gins, and ginning too close, too wet, or too dry.

**Flax production in Argentina,** H. L. Bolley (*North Dakota Sta. Bul. 253 (1931), pp. 84, figs. 84*).—The production of seed flax in Argentina is described extensively from a personal survey made to study growing conditions and methods and to determine the relations of Argentine flax growing to flaxseed production and marketing and industrial and rural life in the United States. Information is given on producing districts, soils, climatic conditions, general agricultural conditions and production, the relation of flax to other major crops, flax varieties, fiber flax, cultural methods, diseases, insects, weeds, and handling and marketing of flax (and grain). Trade relations between Argentina and the United States are discussed briefly. Chemical analyses of samples of flaxseed collected in Argentina by the author are reported by T. H. Hopper.

**The occurrence of normal (unproliferated) florets in Poa bulbosa in the United States,** M. Halperin (*Jour. Amer. Soc. Agron., 23 (1931), No. 7, pp. 511–515, figs. 5*).—The finding of normal plants of *P. bulbosa* in California and by others elsewhere in the United States is recorded.

**Life history and composition of the soybean plant,** H. L. Borst and L. E. Thatcher (*Ohio Sta. Bul. 494 (1931), pp. 96, figs. 25*).—The influence of the rate and date of planting soybeans on their growth and composition is reported on by Borst from studies at Columbus, and the yield and composition of soybeans at various stages of maturity are described by Thatcher from experiments with several varieties at Wooster.

Manchu, an early, large-seeded variety grown for seed, and Peking a small-seeded sort used for hay, were planted at Columbus in 28-in. rows at a thick rate, plants 0.75 to 1 in. apart; medium, 3.5 in.; and thin, 8 in. apart starting from April 10 to 19 with subsequent plantings May 1 and at 2-week intervals until August 1. The rate of planting affected height and growth habit in both varieties, the taller and more slender plants being in the thicker plantings, but did not influence the proportion of stems to leaves or the nitrogen or fiber contents. The thick rate produced the highest yields of forage and seed from all planting dates. For forage production the best time for planting Manchu was April 20 to June 1 and Peking May 1 and 15, and both produced the highest seed yield when planted April 15 to 20. No consistent relation appeared between forage yield and seed yield. Effects of varying the rate of sowing apparently were not influenced by the planting date.

Initial slow growth of the early plantings seemed largely due to low temperature. The growing period of the varieties became progressively shorter with each later planting. Manchu soybeans produced seed every year when planted August 1, and Peking when sown July 1, although maturity was uncertain. Forage yields with both sorts decreased with successive plantings after June 1, because of shorter season and lack of soil moisture.

The periods or dates of maximum yield of the several plant parts were determined. The maximum yields of total tops occurred at Columbus when seed was forming, September 10 for Manchu and September 20 for Peking, and at Wooster about September 15; of leaves on Manchu August 20 and Peking August 31 and at Wooster about August 15, at development stages ranging from pods forming to small seed forming; of stems during late August and early September; of pods when the seeds were about two-thirds formed; and of roots about the time pod and seed formation began, August 20 to 30 at Columbus and September 1 at Wooster. The increase in weight of seed per acre was very rapid, exceeding 50 lbs. per acre per day during most rapid growth.

The root-top ratio at Columbus gradually increased from about 1:2 two weeks after emergence until finally about 1:13 for Manchu and 1:10 for Peking. At Wooster its average ranged from 1:6 at full bloom to 1:10 at maturity. The leaves comprised from 70 to 80 per cent of the combined weight of leaves and stems at Columbus 40 days after planting and from then on decreased to 60 per cent just before leaf fall. At Wooster stem-leaf ratios averaged 1:2.48, 1:2.16, 1:1.79, 1:1.46, and 1:0.94 for the several harvests at 15-day intervals.

The protein content of Manchu at Columbus decreased from 22 per cent early in July to 17.5 early in August, afterwards increasing to 22.7 per cent on September 22. Similar tendencies were noted for Peking and at Wooster. The nitrogen percentage in the leaves was nearly twice as high as in the stems and decreased about half as the plants matured, and that in the stems to about two-thirds the initial percentage. Pods had a maximum nitrogen content of 3 to 4 per cent when seed began to form, but this decreased to from 1 to 2 per cent at maturity. The nitrogen percentage in the seed seemed to decrease slightly as the seed matured, and that in the total tops decreased during rapid growth and rose as the seed matured.

The maximum quantities of nitrogen per acre were reached in Manchu at Columbus between August 15 and 20 and in Peking about 10 days later when pods were forming, at Wooster in the leaves about August 15 and in the stems about August 30, in the pods at both places about 10 days later than in the leaves, in the tops of Manchu at Columbus and in varieties at Wooster early in September and in Peking at Columbus about 10 days later, just before normal leaf fall, and in the roots about August 15.

As to phosphorus, the total tops contained about 0.3 per cent and changed but little with different harvest dates, although there was some indication of an increase at maturity. The phosphorus content of the leaves and stems decreased toward maturity. At maturity seeds contained about 0.75 per cent of phosphorus, or about four times that of the leaves, stems, and pods. The pounds per acre of phosphorus in pods increased until seed began forming and then decreased, indicating a movement from the pods into the seeds.

The percentage of potassium in the total tops at Wooster decreased slightly after full bloom and rose again at the end of the season. The total potassium per acre in tops increased, while the leaves, stems, and apparently the roots, decreased in content of potassium toward maturity. Storage of potassium in the leaves was highest early in pod formation and then decreased, while storage in the stems decreased somewhat later than in the leaves, about the time seeds were forming rapidly. The potassium percentage in the pods was relatively higher than in the leaves and stems but fell rapidly as seed developed. The percentage and quantity of potassium per acre was relatively higher in the mature seed than in other plant parts.

A decrease in calcium percentage in the total tops was observed toward maturity. The most calcium per acre in total tops was obtained about September 1, and was followed by a decrease probably due largely to leaf fall. The calcium percentage in plant parts was highest in leaves followed in order by pods, stems, roots, and seeds. There was indication of storage of calcium in the stems, followed by a movement into the pods where it accumulated toward the end of the season. The percentages and quantities of magnesium and calcium were similar in the stems; magnesium was slightly higher in the roots and seeds and much lower in the leaves and pods.

The quantities of nitrogen and mineral matter removed from and returned to the soil by the soybean crop under various methods of utilization, as calculated from the Wooster data, are tabulated and discussed.

**Pekwa, a new soybean,** R. J. GARBER and M. M. HOOVER (*West Virginia Sta. Bul. 247 (1932), pp. 8, figs. 5*).—The Pekwa soybean, developed by the station as a pure line selection (I–21–7) from the Peking variety, is characterized by marked ability to retain its leaves and fine stems, which combine to make it very desirable for hay. Its hay and seed yields have been similar to those of Wilson soybeans, although Pekwa matures a few days later. Another pure line selection (I–21–8) from Peking, named Kingwa, and later and less uniform than but otherwise very similar to Pekwa, was sent to the Indiana Station and proved well adapted to southern Indiana.

A simple device for testing mechanically the leaf retention of bundles of soybean plants is described and illustrated.

**A comparison of the effect of rainfall on spring- and autumn-dressed wheat at Rothamsted Experimental Station, Harpenden,** "ALUMNUS" (*Jour. Agr. Sci. [England], 22 (1932), No. 1, pp. 101–114, figs. 5*).—In the years 1854–1877, when wheat plats on Broadbalk Field received nitrogen fertilizers only in the autumn, the average decrease in yield caused by each additional inch of rain exceeded the average decrease from 1854–1918, a difference not held due to change in fertilizer treatment. The period of 24 years was too short to allow seasonal variation in the effect of rain to appear, since it was only possible to compare such seasonal variation with that of 1854–1918 in one plat. In that case summer rainfall was more detrimental to autumn-dressed than to spring-dressed plats, and this observation was confirmed by studies of the effect of rain on the difference in yield of two plats which differed only in the time of application of their fertilizers. See also a previous note by Fisher (E. S. R., 53, p. 14).

**Colorado pure seed law** (*Colorado Sta., 1931, rev., pp. 17*).—The text of the Colorado pure seed act is given with interpretations, explanations, and suggestions.

**Inspection of agricultural seeds,** H. R. KRAYBILL, O. S. ROBERTS, R. O. BITLER, R. B. SCHULTE, E. M. PATT, and P. BALBACH (*Indiana Sta. Circ. 186 (1931), pp. 106, fig 1*).—The germination percentage, purity, weed seed content, and for legumes the hard seed content are tabulated for 1,568 official samples of seed collected from dealers in Indiana during the year ended June 30, 1931.

**Legume inoculant tests in 1931**, A. W. Hofer and H. J. Conn (*New York State Sta. Bul. 602 (1931), pp. 12, figs. 2*).—Tests of samples of legume cultures purchased in New York from dealers and submitted by manufacturers in 1931 showed all but one product to be satisfactory. Farmers are advised to buy only cultures whose dates of expiration have not been reached and not to buy undated cultures.

## HORTICULTURE

**[Horticulture at the Mississippi Station]**, W. E. Ayres, S. J. Greer, and H. F. Wallace (*Mississippi Sta. Rpt. 1931, pp. 54, 62–64, 70–72*).—At the Delta Substation the Marglobe, Louisiana Pink, and Livingston Globe tomatoes produced more than 10 tons of fruit per acre during a period of 5 years. Marglobe produced the largest fruits. Profitable increases in yield of tomatoes were secured with superphosphate, with only slight increases from potassium or nitrogen.

In connection with work with fruits and vegetables at the Natchez Substation considerable progress was made in the improvement of the Gulf States Market tomato by selection.

Of 23 varieties of tomatoes tested at the Raymond Substation in 1930 Norton produced the greatest yield of shipping tomatoes. Over a 4-year period Crystal Spring Market was the most productive variety. Over the 5 years of the experiment a ton per acre of 3–10–3 fertilizer proved most profitable for tomatoes, and at least 3 per cent of potash is needed in order to develop proper color and plant vigor. Cottonseed meal proved to be a good source of nitrogen for tomatoes. Based on a 7-year average, 1,000 and 1,500 lbs. of 4–8–4 fertilizer gave good results with beans. Calurea proved to be a valuable source of nitrogen. Burpee Stringless Greenpod was the most productive variety in 1930. An application of 1,000 lbs. per acre of 3–10–3 fertilizer is recommended for peas. Ammonium sulfate proved the most valuable source of nitrogen and Thomas Laxton the leading producer in 1930.

**[Horticultural investigations at the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 38–45, 46, 60–62, 63, 64, 66*).—As reported by E. L. Overholser and F. L. Overley the Delicious apple had a higher total sugar and total solid content at harvest and after 20 weeks in storage than did two of its sports. Overholser and L. L. Claypool thinned early Elberta peaches on June 12 so that there were 35, 51, 66, 96, and 125 leaves per fruit. Part of the limbs were girdled. At harvest the fruits were weighed and found consistently heavier as the number of leaves per fruit increased. Nitrogen and moisture were less and total sugars and sucrose greater as the number of leaves increased. Ringing tended to increase the percentage of ash, reducing sugar, and total sugar.

Soil temperatures recorded by Overholser, Overley, and Claypool in the Oroville district at 10-in. depths during the mild winter of 1930–31 averaged 2.7° F. higher under alfalfa than under paper mulch or dust mulch, 2.4° higher than under a cover of 4 in. of sawdust, 1.9° higher than under 4 in. of manure, and 4.9° higher than under dry, hard-packed soil.

Attempts by O. M. Morris and Claypool to root hardwood cuttings of apple were generally unsuccessful, although a few Wealthy cuttings after a period of storage in outdoor soil did root in moist sand when given bottom heat. Nearly all of the cuttings callused and produced leaves. The resistance of apple seedlings to low temperature apparently depended a great deal on the condition of the seedling. All of several cover crops seeded in the spring of 1931 by Morris and Overley in a mature apple orchard near Wenatchee failed to become established, due apparently to water shortage. Successful stands obtained in sprinkler plats indicated that cover crops need more frequent watering than do trees.

Overholser and Overley reported that Jonathan trees receiving phosphorus or potash alone made but little new growth and produced only about half as much leaf area as did trees receiving nitrogen. The heaviest set was on trees receiving nitrogen and phosphorus and the largest fruits on the trees receiving nitrogen and potash. Nitrogen reduced color, and the fruit from the nitrogen plats showed the highest percentage of breakdown in storage.

Respiration studies conducted by Overholser and Claypool on Clark Seedling strawberries from fertilizer plats indicated that nitrogen increased the rate of metabolism about 10 per cent as compared with the check. Applications of phosphorus apparently depressed respiration activity.

As recorded by Overley and Overholser, under-tree sprinkling increased the size of Jonathan apples but delayed maturity and color development and is considered practical only on open gravelly soils and on hillsides where it is impossible to irrigate by furrows without considerable run-off. Silty water left a residue on the leaves and fruit resembling lead arsenate in appearance and was very difficult to remove.

Considerable drop, 12.9 per cent in one case, followed the use of summer oils in the first or second cover sprays following the dormant lime-sulfur spray, whereas only normal drop followed where oils were applied in the later cover sprays. When either liquid lime-sulfur or wettable sulfur was used in the pink and calyx sprays and followed by oil in the first cover spray, very heavy drops of fruit occurred. Used only in the second cover spray, oils caused much smaller losses and in the third and later covers caused no injury.

Morris observed that peaches from trees making rapid growth were large in size but poor in keeping quality as compared with fruit from trees of slower growth. Trees carrying extremely heavy foliage, whether the result of fertilizer or not, produced fruit of inferior color and taste and low storage quality. High temperature and sunshine immediately preceding harvest improved the color and flavor of peaches.

Pollination studies with cherries by Overholser, Overley, and Claypool and with apples by Overholser and Overley are reported in detail and set forth favorable and unfavorable combinations. Evidence was presented that color sports, such as Richared, Starking, etc., conform in pollination capacities and requirements to those of the parents.

Strawberry breeding studies conducted by M. B. Hardy and H. D. Locklin showed the $F_1$ population to agree quite closely with parents in yielding capacity, but the seedlings of selfs of average yielding parents were generally lower than that of the crosses between average yielding parents. Work with red raspberries indicated that these fruits are almost completely self- and cross-fertile. Working under the controlled conditions of the laboratory, Hardy and Locklin determined the temperatures that killed approximately 50 per cent of the buds of Cuthbert, King, Marlboro, Antwerp, and Latham and found Latham and Antwerp to be the most hardy, with Cuthbert the least hardy. Cuthbert responded most quickly to growing conditions and Antwerp least readily, with King and Marlboro intermediate. Hardy found that the type of bag or covering placed over emasculated raspberry blooms had little influence on the set of seeds.

Progress in tomato breeding is reported by C. L. Vincent, some highly promising material being obtained from crosses between Bonny Best and Sutton

Best of All. Certain of the seedlings kept longer at 32° than did either parent, all being picked at the same degree of ripeness and held under comparable conditions.

Orchard irrigation studies conducted by Claypool and C. A. Larson at the Irrigation Substation showed increases in yield and size of Winesap apples as the amount of water was increased, but color was diminished. Little effect was noted on Rome, but the color was somewhat better on the low-water plats. Average leaf size increased as the rate of water application was increased.

No differences were recorded by Claypool in the yield of Anjou pears fertilized in various ways. A comparison of light, moderate, and severe pruning on Rome and Winesap trees 10 years of age showed much larger yields in the lightly pruned plants, but color and size were inferior.

Claypool and Overholser found the J. H. Hale peach to be self-unfruitful but partially fruitful with Phillips, Elberta, Slappy, Muir, and Gold Medal. Bartlett and Anjou pears were partially self-fruitful and fruitful when pollinated with Comice and Winter Nelis.

Claypool reports that old cherry trees which passed through the cold winters of 1909 and 1919 failed to recover from the cold of 1930. According to Claypool, barnyard manure as compared with commercial fertilizer hastened the maturity and increased the size and firmness of heads of New York lettuce.

Storage studies conducted by D. J. Crowley at the Cranberry Substation showed that berries from fertilized vines kept as well as those from the check plats.

**The effects of heavy applications of phosphorus on the inter-relation of soil reaction, growth, and partial chemical composition of lettuce, beets, carrots, and snap beans,** H. H. Zimmerley (*Virginia Truck Sta. Bul. 73 (1930), pp. 861–928, figs. 9*).—Submitted also as a doctorate thesis at the University of Maryland, this paper presents the results of a study of the effects of soil reaction and of large amounts of superphosphate on the growth and chemical composition of beans, beets, carrots, and lettuce growing in soils the reaction of which was maintained at different pH levels by the use of lime or of aluminum sulfate. In general heavy applications of superphosphate greatly reduced root injury and markedly stimulated foliage growth of beets, lettuce, and carrots in the more acid soils and increased the yield of lettuce and beans throughout the entire reaction range employed.

Of the four crops, beets and lettuce were the most sensitive to acid, many seedlings succumbing and top growth being badly stunted at pH 5. Carrots tolerated acidity above pH 5.2 but suffered severe root injury at lower reactions. Beans were least affected by soil acidity, no root injury being evident at pH 4.9. On the other hand, beans were most susceptible to neutral and alkaline conditions. Nearly neutral soils were harmful to lettuce and carrots.

The results of chemical analyses of beets and lettuce indicated that phosphorus and calcium deficiency may have contributed to the retarded development of these crops on highly acid soils. The author deems it probable that the higher concentrations of soluble phosphorus in the heavily phosphated soils reduced aluminum toxicity by precipitating the soluble aluminum compounds and also by increasing the permeability of the membranes to phosphorus and calcium. H-ion concentration of the soil solution may have also influenced nutrient absorption.

Chlorosis of plants on neutral or alkaline soils is believed due to the deficiency of some element, perhaps iron, manganese, or magnesium, gradually rendered insoluble. Chlorotic tissues were found very low in reducing sugars, sucrose, starch, and total carbohydrates and very high in soluble nitrogen, indicating a disruption of the normal photosynthetic and carbohydrate metabolism processes. Analyses of chlorotic bean tissues indicated that this condition is not the result of phosphorus deficiency.

Practical recommendations include the following optimum ranges for soil reaction: Beets pH 5.8 to 7.1, lettuce 5.7 to 6.5, carrots 5.3 to 6, and beans 5.3 to 6, with pH 6 as a favorable point for most vegetables.

**Carrot culture,** J. W. Lloyd (*Illinois Sta. Circ. 386 (1932), pp. 8, figs. 4*).—General cultural requirements are considered.

**Cauliflower for Corn-Belt gardens,** J. W. Lloyd (*Illinois Sta. Circ. 385 (1932), pp. 11, figs. 5*).—A presentation of general information.

**Tomato varieties and fertilizers for the Lower Rio Grande Valley,** W. H. Friend (*Texas Sta. Bul. 438 (1931), pp. 38, figs. 7*).—Beginning with a general discussion of tomato growing in the Lower Rio Grande Valley, the author presents the results, largely in tabular form, of variety and fertilizer tests. In general, varieties of the semiglobe or oblate form were most desirable, and of these Bonny Best, John Baer, and Clark Early are deemed especially promising. Based on a single year's trials, spacing 3 by 3 ft. gave better results than did 3 by 6 ft. or 6 by 6 ft., the acre yields of Cooper Special being 19,114, 12.674, and 6,036 lbs. per acre, respectively, with average weight of individual fruits practically equal.

In the fertilizer tests, manure at the rate of 20 tons per acre gave the largest and most consistent yield increases. Superphosphate applied at the rate of 600 lbs. per acre gave yields approximately 75 per cent lower than those obtained with manure and 61 per cent lower than those secured with 1,200 lbs. per acre of a 4-8-8 fertilizer. The occurrence of "pocketing" was not materially affected by the use of fertilizers but appeared somewhat less on the 600-lb. superphosphate plats.

**Effect of various temperatures on the storage and ripening of tomatoes,** R. C. Wright, W. T. Pentzer, T. M. Whiteman, and D. H. Rose (*U. S. Dept. Agr., Tech. Bul. 268 (1931), pp. 35, pls. 3, figs. 5*).—Storage experiments conducted at Arlington Experiment Farm with tomatoes grown at the farm and with Florida tomatoes purchased in the open market indicated that green ripe tomatoes can be stored for several days at relatively low temperatures without interfering with subsequent ripening. Tomatoes held at 40° F. for 11 to 15 days ripened more slowly than usual but assumed a normal color. Stored at 32 and 36° for periods up to 5 to 8 days tomatoes ripened satisfactorily though slowly. Held at 50° for less than 14 to 18 days, tomatoes ripened normally when placed in a favorable temperature. The greener the tomato the greater was the slowing effect of chilling storage on subsequent ripening.

Tomatoes in the turning stage when picked ripened almost normally at 50°, while at 40° there was usually no ripening irrespective of the stage of maturity when harvested. A temperature of 55° was the lowest at which full ripening with good color and flavor took place, and since no indication of abnormal decay or breakdown was apparent at this temperature, 55° is recommended for either storage or delayed ripening purposes. Ripening was more rapid at from 60 to 70°, and this range is recommended for ripening but not for storage. Temperatures above 70° are not recommended because of rapid rate of decay. For firm, fully ripe tomatoes a temperature of 55° proved most satisfactory. Held at 32°, tomatoes kept for from 8 to 10 days but broke down rapidly upon removal from storage. Comparable results were secured with Florida and home-grown tomatoes. Mature green tomatoes picked the evening before the first field frost ripened more rapidly and with less decay than those picked directly after the frost.

**Preservation freezing: Some effects on quality of fruits and vegetables,** J. G. WOODROOF (*Georgia Sta. Bul. 168 (1931), pp. 23, figs. 11*) —Presenting a comprehensive review of the literature relating to the effects of freezing on fruits, vegetables, and other plant tissues, the author reports that microscopical studies at the station showed all of 25 kinds and 71 varieties of fruits and vegetables frozen to be dead when thawed. The cell walls were not ruptured, but the cell contents were precipitated and considerable juice lost from the tissue, resulting in a decrease in turgor. It is believed that injury is due largely to ice formation, with the consequent result that water is so abruptly withdrawn from the protoplasm as to destroy its colloidal properties, making reabsorption impossible. This loss of moisture due to desiccation is a common tendency in cold stored products but is reduced to a minimum when the product is packed in air-tight containers. The addition of sugar sirup further reduced desiccation in direct ratio to the concentration of the sirup.

In no case did freezing completely inhibit katabolic activity. Further evidence that the changes occurring during freezing are comparable to those occurring during cooking was that less time was needed to cook products that had been frozen than fresh materials.

The outstanding physical change during freezing, irrespective of temperature used, was expansion. Fruits and vegetables with an inelastic covering often burst. However, the amount of expansion varied with the temperature, the concentration of the plant juices, and the number and size of the intercellular spaces in the tissue. For example, peaches and figs with considerable air-filled intercellular spaces had less tendency to burst. A second physical change observed was the tendency in liquids for the solvent to separate from the solute during freezing.

In comparing the effects produced by freezing, cooking, salting, and sugaring on pear, banana, peach, and tomato flesh, the author found similarity in all four cases, although the type of precipitation produced differed in shape and size of the mass and the position in the cells. The degree of temperature employed also influenced the type of precipitation in peach flesh.

**[Fruit freezing tests at the Georgia Station]** (*Georgia Sta. Rpt. 1931, pp. 36, 37, 42. pls. 2*).—In the process of freezing, peaches, blueberries, avocados, figs, Labrusca grapes, raspberries, and Japanese persimmons lost all or nearly all of their characteristic aroma, whereas cantaloupes, grapefruit, muscadine grapes, cherries, and strawberries retained practically all, and orange juice, tomatoes, dewberries, and blackberries, a considerable part. Cantaloupes, blueberries, grapefruit, muscadine grapes, figs, cherries, and strawberries retained practically all of their flavor after freezing. Freezing at a temperature of 15° F. or above failed to preserve the desirable red color in the flesh of peaches and figs, and a combination of high vacuum in tins and high freezing temperature resulted in almost complete loss of red pigment after 8 months' storage. An initial temperature of below 0° destroyed the red pigment of figs. Freezing was found best adapted to highly flavored, highly colored, and rather acid small fruits. Fruit tissues upon thawing appeared processed and were most inviting when used promptly. Slow thawing is deemed desirable, and each product had an optimum temperature at which it could be frozen and stored. Quick frozen peaches lost less moisture through evaporation in the frozen state and less by leakage after thawing than did slow frozen peaches. Covering fruit before freezing with isotonic aqueous solutions of sucrose decreased the destructive effect of freezing on structure and practically eliminated desiccation. At 80, 35, and 0° fresh peach tissue kept 1 week, 1 month, and 1 year, respectively. Katabolic reaction was reduced to about one-fourth by storing at

35° and to about one-fiftieth at 0°, as compared with reactions at orchard temperatures in summer.

Frozen peaches when stored in hydrogen, nitrogen, and carbon dioxide appeared to keep well. Little difference was noted in the appearance of peaches stored in buffer solutions of different H-ion concentrations. Peaches coated with collodion, shellac, and paraffin and stored at 40 and 10° kept well, but near the pit a very disagreeable taste was noted, and since the titratable acidity increased it is believed that an acid other than the usual malic and citric of fresh peaches was present. Elberta peaches frozen quickly with solid carbon dioxide and stored at 10° had a lower respiration rate than peaches frozen and stored at 10°. Quick frozen peaches showed a lower percentage of soluble pectin and a higher percentage of protopectin than those frozen at 10°. In both groups the percentage of soluble pectin increased and the percentage of protopectin decreased with time.

**A survey of winter injury of fruit during 1930 in Washington,** E. L. OVERHOLSER, F. L. OVERLEY, and L. L. CLAYPOOL (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 253–258; abs. in Washington Col. Sta. Bul. 260 (1931), p. 79*).—Observations by the Washington Experiment Station in the summer of 1930 following unusually low temperatures in January showed greater injury where the soil had been unprotected by snow, cover crops, weeds, tar paper, or other materials. Trees from 1 to 8 years old suffered more root injury than did older trees. Injury was greater where the soil was packed before it froze. Insufficient moisture in the soil preceding freezing tended to increase injury, and more injury was noted in trees on sandy or gravelly soils than in those on heavier clay loams.

The condition of the top was not an accurate index to root injury because some trees improved and others appeared worse after a summer's growth. Severe pruning of the top aided in recovery, and inarching with one or more young nursery trees helped in some cases. Sweet cherries suffered less than apples. The fruit of root-injured apple trees ripened unevenly, was often off type, and in some varieties was affected with drought spot.

In the Yakima Valley where snow protected the roots the above-ground portion of cherry and peach trees was severely injured, old cherry trees most of all. Apricots appeared more hardy than either old cherries or peaches, and mature English walnuts were intermediate between the old sweet cherry and the apricot. Three-year-old Bosc pears were seriously injured, in some cases killed, while Anjou pears of the same age suffered only 10 per cent injury. Bartletts suffered but little, and Flemish was hardiest of all. Apples, plums, and sour cherries suffered no top injury.

**[Pomology at the Georgia Station],** J. G. WOODROOF and J. E. BAILEY (*Georgia Sta. Circs. 93 (1931), pp. 4, figs. 2; 94, pp. 6, figs. 4; 95, pp. 14, figs. 3; 96, pp. 12, figs. 5; 97, pp. 4, figs. 2; 98, pp. 8, figs. 2*).—In these circulars entitled, respectively, Berry Varieties and Pest Control, Muscadine Grape Varieties and Culture, Peach Varieties and Culture, Growing Pears in Georgia, Fig Varieties and Culture, and Pecan Varieties and Culture, varietal and cultural information of a general nature is presented.

**Directions for spraying fruits in Illinois** (*Illinois Sta. Circ. 388 (1932), pp. 22, figs. 4; Sup., pp. 2*).—This pamphlet, a revision of an earlier circular (E. S. R., 51, p. 40), presents spray schedules for tree fruits, bush fruits, and grapes, and gives directions for preparing various sprays and dusts.

**Sampling of apples for arsenical spray residue determinations,** J. R. NELLER (*Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 4, pp. 382–384, figs. 4; abs. in Washington Col. Sta. Bul. 260 (1931), p. 78*).—Studies at the Washington Experiment Station upon three different lots of apples that had been washed in dilute hydrochloric acid showed that the average probable error of single samples consisting of six apples each was 8.2 per cent, while that of duplicate samples was 5.36 per cent of the total arsenic on the fruit. Since the average probable error of analysis was found to be 7.4 per cent, the author suggests that two samples of six apples each apparently constitute a sufficiently accurate sampling. The washed apples carried an average arsenical load of 0.018 grain as $As_2O_3$ per pound, and the author believes that the recommendations may be safely applied to apples carrying the tolerance limit of 0.01 grain or less of arsenic per pound of fruit, whereas the error of sampling was considerably reduced by using duplicate rather than single samples. The rate of reduction was much less for triplicates, quadruplicates, etc.

**The effect of different methods of irrigation on the size and color of fruit,** F. L. Overley, E. L. Overholser, and G. Sisler (*Wash. State Hort. Assoc. Proc., 26 (1930), pp. 41–47, figs. 3; abs. in Washington Col. Sta. Bul. 260 (1931), p. 80*).—Comparisons conducted by the Washington Experiment Station of sprinkler irrigation and rill or furrow irrigation with Jonathan and King David apple trees showed sprinkling to induce better growth, as indicated in leaf area and terminal development, and to give larger but poorer colored fruits which were also slower in ripening.

**Relation of catalase activity to physiological breakdown in Jonathan apples,** J. R. Neller (*Plant Physiol., 6 (1931), No. 2, pp. 347–354, figs. 2; abs. in Washington Col. Sta. Bul. 260 (1931), p. 79*).—In studies at the Washington Experiment Station the author found that catalase activity tends to be higher in Jonathan apples going through the breakdown process and to decrease below that of sound fruit in the advanced stages of breakdown. At the same time catalase activity of sound fruits started low and tended to increase, leading to the opinion that physiological breakdown in apples is associated with or caused by an accelerated metabolic rate. Since breakdown is more liable to occur when the crop is relatively small and the fruits large, the author believes that a study of physiological balance with regard to the food supply of the tree and fruit might be worth while.

**Is electrodialysis useful in a study of apple tissue,** J. R. Neller (*Plant Physiol., 6 (1931), No. 2, pp. 355–359, fig. 1; abs. in Washington Col. Sta. Bul. 260 (1931), p. 79*).—No essential difference was revealed in this study at the Washington Experiment Station between sound and physiologically broken down Jonathan apples. Extracts obtained from the anode compartment consisted almost entirely of malic acid, with very small amounts of nitrate, sulfate, and chloride ions. Extracts from the cathode compartment contained very little calcium and appreciable amounts of potash, enough to account for over half the ash. Practically all the basic dialyzable material was obtained during the first 6-hour period although malic acid continued to dialyze at a decreasing rate through three 6-hour periods.

**Beurre d'Anjou pollination studies in Washington for 1930,** F. L. Overley and E. L. Overholser (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 397–399; abs. in Washington Col. Sta. Bul. 260 (1931), p. 79*).—Anjou pear blooms hand pollinated with Bartlett, Flemish, Winter Nelis, Easter Beurre, Bosc, and Anjou set 58.1, 52.4, 51.9, 49.7, 45.2, and 8.9 per cent of fruit, respectively, as compared with 13.8 per cent for open-pollinated blooms. Trees receiving fertilizer containing nitrogen tended to set better than those not receiving nitrogen. Records of the 1929 bloom and set of Anjou spurs, the leaf number of which was counted in 1928, showed a positive correlation between leaf number in one year and the set the subsequent season. Leaf samples collected from heavily producing Anjou trees weighed from 4 to 8 gm more per

25 leaves than did leaves from lightly producing trees. Increased spur length and diameter of buds generally accompanied greater leaf area.

**Cherry pollination studies in Washington for 1930**, E. L. Overholser and F. L. Overley (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 400–403; abs. in Washington Col. Sta. Bul. 260 (1931), p. 79*).—Of 13 cherries used by the Washington Experiment Station for pollinating emasculated Bing flowers, Napoleon, Lambert, and Bing were ineffectual and the remainder satisfactory. Using pollen obtained from 27 different Deacon trees on Bing flowers, good results were obtained in every instance. Of 10 varieties used to pollinate Napoleon, four, Lambert, Bing, Centennial, and Napoleon, gave unsatisfactory results. Of 6 varieties of pollen used on emasculated Lambert blossoms, Lambert, Bing, and Napoleon proved unsatisfactory, although small percentage sets, 3.1 and 5.2 were secured with Lambert and Napoleon, respectively. Of four pollens tested on Deacon flowers, Deacon, Bing, Lambert, and Napoleon, Deacon alone proved useless, giving no set.

**[Tung oil culture at the Georgia Station]** (*Georgia Sta. Rpt. 1931, pp. 37, 38, fig. 1*).—Marked differences in the hardiness of tung-oil trees were noted in planting at the station, and stock grown from seed obtained from northern China was found particularly promising in this respect. The uses of tung oil are briefly discussed.

## FORESTRY

**[Forestry at the Georgia Station]** (*Georgia Sta. Rpt. 1931, pp. 42–47, figs. 3*).—Notes are given on plantings made in cooperation with the U. S. D. A. Forest Service at the Mountain Substation of oriental chestnuts and white pine.

**Ohio Forest News, [January, 1932]** (*Ohio Forest News [Ohio Sta.], No. 16 (1932), pp. 8, figs. 2*).—Supplementing brief articles relating to farm forestry, forest clubs, etc., a list is offered of spruces growing at the Wooster Arboretum.

**Trees for Wyoming farmers and ranchmen** (*Wyoming Sta. Circ. 25 (1931), pp. 4*).—In connection with a price list of available forest tree seedlings, brief notes are given on planting, culture, and the characteristics of the several species.

**Polyembryony and germination of polyembryonic coniferous seeds**, T. S. Clare and G. R. Johnstone (*Amer. Jour. Bot., 18 (1931), No. 8, pp. 674–683, pl. 1*).—Multiple seedlings were observed in three species of pine, namely, *Pinus torreyana*, *P. sabiniana*, and *P. cembroides monophylla*. In those seeds where two embryos of equal or nearly equal development occurred, one embryo was directly above the other. Polyembryony in each species usually showed a selective development, one embryo being much larger than the others. No evidence of polyembryony was found in dissected seeds of *P. coulteri* or *P. tuberculata*. Multiple embryos occurred more frequently in the seeds of *P. cembroides monophylla* than in any other species studied.

**Root growth of white pine (Pinus strobus L.)**, C. L. Stevens (*Yale Univ. School Forestry Bul. 32 (1931), pp. 62, pls. 6, figs. 8*).—In this study, carried on jointly by the New Hampshire Experiment Station and the Yale University School of Forestry, periodic measurements were made throughout two growing seasons to determine the rate of growth of lateral roots of 4- to 6-year-old field-grown white pines.

Roots made no growth from November 15 to April 1 in the field, but when a tree was brought into the greenhouse root growth continued approximately as rapidly in winter as in summer. There were two periods of rapid growth in the open, namely, in spring and autumn. Vigorous roots slowed down in midsummer, while weak roots often came to a full stop. No correlation could be established between root growth and weather or soil conditions.

The amount of annual growth varied widely between individual roots. Some evidence was found that the rate of root growth increases with age during the early life of the tree. Height growth of the above-ground parts was practically completed when the rate of root growth slackened in midsummer. There was no apparent correlation between the amount of root growth and the amount of top growth, but in general trees with vigorous tops possessed rapidly growing root systems and vice versa.

Practical deductions are that failures in plantations should not be replaced later than one year after the trees were set, and that in replacing the stock used should be of the same age as that of the surviving trees. Planting up natural openings in the forest is seldom worth the expense. For 4-year-old white pines set 6 by 6 ft. apart on sandy soil root competition may be expected within 5 years after planting, while on clay competition may be delayed until the tenth year.

**The scrub oak type in Pennsylvania,** A. C. McIntyre (*Forest Leaves, 23* (*1932*), *No. 5, pp. 74–77*).—Stating that approximately one-sixth of the forest land of Pennsylvania is occupied by scrub oaks of little or no commercial value. the author in this contribution from the Pennsylvania Experiment Station lists the species associated in the scrub oak type and groups them according to desirability. He states that scrub oak is a temporary type fostered by repeated fires which destroy better species. Scrub oaks, however, decrease erosion, and with the suppression of fire would give way in the course of 25 to 50 years to a more valuable forest. The conversion of the scrub oaks to valuable species by planting is not considered economically feasible, but the random spotting of seed or seedlings of desirable species to supply mother trees for the future forest is considered promising.

**Stumpage and log prices for the calendar year 1929,** compiled by H. B. Steer (*U. S. Dept. Agr., Statis. Bul. 36* (*1931*), *pp. 61, figs. 3*).—Tables are included showing for 1929 data similar to that previously noted for 1928 (E. S. R., 65, p. 43).

**More turpentine, less scar, better pine,** E. Gerry (*U. S. Dept. Agr. Leaflet 83* (*1931*), *pp.* [*1*]+*4, figs. 7*).—The system of low chipping previously noted (E. S. R., 66, p. 337) is described and discussed.

## DISEASES OF PLANTS

**[Plant pathology at the Georgia Station]** (*Georgia Sta. Rpt. 1931, pp. 33–36, pl. 1*).—Selection beyond the third and fourth filial generations did not apparently increase wilt resistance in the Globe tomato. Pure line selections from a cross between the Globe and Burpee tomatoes, and from back crosses to the Globe parent yielded a few strains much more resistant than either parent. The first generation progeny of crosses between the cherry tomato and resistant types was more susceptible to wilt than was either parent. Fruit and leaf characters were intermediate, and the $F_1$ populations were very uniform.

Comparisons between the disease of the pimiento pepper known as ripe rot and of cultures grown from *Vermicularia capsici* obtained from India showed them to be identical. In fact peppers inoculated with conidia of the Indian cultures developed symptoms of ripe rot. It was observed that the fungus hibernates on trash and decayed fruits left in the field.

Observation of six dust treatments, an untreated check, and one delinted lot of cottonseed soaked in mecuric chloride solution showed the dusts to be highly effective in the control of seed-borne diseases of cotton.

Finding that the Spanish peanut is very susceptible to *Cercospora personata* leaf spot, crosses were made between this type and the Virginia Runner and Carolina Runner resistant varieties.

In studies of peach rosette it was noted that temperatures between 15 and 27° C. favored the rapid development of rosette in inoculated trees, and that higher or lower temperatures retarded the spread. The disease could not be transferred to the Irish potato or the pepper.

A high lime 3-9-50 Bordeaux mixture gave favorable results in spraying cantaloupes at the Coastal Plain Substation for the control of downy mildew. Spraying in the early period of development actually reduced yields and delayed maturity. One of the major difficulties in spraying cantaloupes was to get the material on to the lower surface of the leaves.

Treatment of tomato seedlings while still in the seed bed with various dusts and sprays gave promising results, especially in the case of Bordeaux mixture applied at weekly intervals. A combination of seed disinfection and Bordeaux mixture gave almost complete freedom from nailhead blight. Copper lime dusts were found almost worthless. Plants from the several treatments were sent to the Delaware, Indiana, and Maryland Experiment Stations, which cooperated in obtaining final readings.

**[Plant pathology at the Mississippi Station]**, L. E. MILES (*Mississippi Sta. Rpt. 1931, pp. 43-47*).—Excellent control of narcissus root rot was secured by soaking the bulbs for 1 hour in a 1-1,000 solution of bichloride of mercury or for 2 and 6 hours in a 0.25 per cent solution of Semesan. Calogreen and Calochlor gave the best results of all. In cottonseed treatment studies some evidence was obtained that injury may have resulted from the volatilization of certain of the mercury compounds used. Some evidence of similar injury was also noted on gladiolus corms.

Potash fertilizer applied at the South Mississippi Substation to cotton growing on soil heavily infested with wilt decreased the wilt when used in moderate amounts and when well balanced with other elements. No significantly better results followed the use of large amounts of potash in relation to phosphorus and nitrogen, nor was wilt reduced further by simply increasing the total quantity of fertilizer applied. A deficiency of potash appeared to increase wilt more than did a deficiency of nitrate.

Tissue platings made from 19 cotton plants located on the Fusarium wilt test plats at the Delta Substation showed the organism present to be a species of Verticillium, tentatively designated as *V. alboatrum*, and not *F. vasinfectum* as was expected from the fact that the soil had been artificially inoculated with cultures of *F. vasinfectum* each year of the preceding five.

**[Plant pathology at the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 13, 14, 47-50, 62, 63*).—Four physiologic forms of *Tilletia tritici* and three of *T. levis* were tested by E. F. Gaines, W. K. Smith, H. H. Flor, and C. S. Holton on 36 varieties of winter wheat, and the results showed five varieties possessing resistance to all seven forms of bunt. Inoculation of 22 drought-resistant wheats obtained from the Union of Socialistic Soviet Republics, five varieties of rye, and a rye-wheat hybrid, *T. secalotricum*, with a mixture of physiologic forms of *T. levis* and *T. tritici* showed only the rye and the rye-wheat hybrid to be immune. Hope wheat was found highly resistant to all forms of bunt.

G. A. Huber found that one of the most important sources of blue mold on apples is old dirty containers, there being over 32,000,000 spores present on the bottom boards alone in some cases.

The plant disease survey conducted by F. D. Heald, L. K. Jones, and G. A. Newton in cooperation with the U. S. Department of Agriculture revealed the presence of several hitherto unreported diseases, including a rotting of pears caused by *Phytophthora cactorum*.

Red mosaic was found by Jones, G. Burnett, and Newton to be abundant and spreading rapidly in western Washington. A total of 82 per cent of tubers tested in the greenhouse were found free of disease. Practically all commercial potatoes were found by Burnett to be infected with a virus capable of causing injury to tomato and tobacco plants. Certain potato virus diseases were found to be caused by combinations of two or more other viruses. The same condition held in the tomato, where it was found that streak disease is caused by a combination of tobacco mosaic and a potato virus. The importance of sanitary measures in the greenhouse for controlling the virus disease is stressed.

Observations by L. L. Claypool at the Irrigation Substation upon the rosette disease showed that affected trees may be restored to normal condition by growing between them an alfalfa crop, whereas applications of fertilizer or cultural treatments gave no benefit.

**Results of pea root rot and eggplant wilt investigations,** C. M. HAENSELER (*N. J. State Hort. Soc. Proc., 1929, pp. 159–168*).—This paper deals briefly with intensive studies and their results bearing upon eggplant wilt disease and pea root rot, soil-borne diseases which have recently caused heavy crop losses in New Jersey.

Eggplant wilt experiments, conducted for eight years, have shown a definite negative correlation between development of the disease and soil acidity; the disease in every case being less severe on very acid than on slightly acid or on neutral soils. The infection was gradually decreased over a period of years but not completely controlled by artificial acidification on severely infected fields. Liming greatly increased the severity of the wilt.

Pea root rot has been intensively studied since the beginning in 1922. Though not readily prevented, it may be greatly reduced by cultural methods, including use of varieties which, although they are susceptible, yield better than other varieties when planted in infected soils; use of crop rotation, including peas only every three or four years, and excluding other legumes, especially vetches and Canada field peas; early planting and encouragement of rapid growth to secure a large vine before infection occurs; avoidance of wet soils; and liberal commercial fertilizers applied as near the roots as safety allows.

**The root-knot of abacá, or manila hemp,** G. O. OCFEMIA and M. R. CALINISAN (*Phytopathology, 18 (1928), No. 10, pp. 861–867, figs. 2*).—Root knot of abacá, or manila hemp (*Musa textilis*), common though not usually serious in the Philippine Islands, is dealt with as regards the results of experiments conducted in 1925 and later. These show that the nematode occurring in the galls of abacá roots and in the soil in fields where bunchy top occurs causes a disease entirely different from bunchy top as reported by Ocfemia (E. S. R., 59, pp. 147, 844).

Root knot, due to *Heterodera radicicola*, causes dwarfing of abacá plants, yellowing of the foliage, reduction in the size of the leaves, and formation of galls in the roots, which finally die and rot.

**Powdery mildew disease of snap beans,** H. T. COOK (*Virginia Truck Sta. Bul. 74 (1931), pp. 929–940, figs. 3*).—Because of very heavy losses of beans in the fall of 1930 on some farms in the area, the powdery mildew (*Erysiphe polygoni*) was studied with respect to ecological factors favoring its development and methods of control. The fungus was observed to fruit freely on all the aboveground portions of the plant, and to cause a brown to red color to develop in the cuticle cells, with those underneath collapsing. Low temperature and lack of soil moisture, conditions unfavorable to the bean, favored the growth and spread of the fungus. Lesions caused by powdery mildew are distinguished from those caused by sun scald, bacterial blight, rust, Rhizoctonia, and anthracnose. The Refugee bean was found quite resistant, and the Bountiful and Hobson Wax highly susceptible to powdery mildew. Cultural conditions favoring the bean helped reduce powdery mildew losses, and spraying or dusting with sulfur aided in control.

**Treating cotton seed by the dusting method,** N. C. Woodroof (*Georgia Sta. Bul. 170 (1931), pp. 16, fig. 1*).—Of a total of 94 chemicals tested as disinfectants for undelinted cottonseed, many were found to be unsatisfactory. In general, mercury compounds were found the best adapted to disinfecting cottonseed. Copper compounds as a class were unsuitable and in many cases actually harmful to the seed. None of the coal tar products proved useful.

The average percentage increase in germination from the highest yielding dust treatment for each year was 8.28 per cent above the untreated check. The increase over delinted seed averaged 10.13 per cent. The average increases in yield from the leading dust treatment over the untreated check and over the acid-treated delinted lot amounted to 140 and 187.1 lbs. of seed cotton respectively.

The benefits of seed treatment were greater in years when cold wet weather followed planting, and hence dust treatments are recommended for regions where stands are often reduced by adverse weather. Ceresan applied at the rate of 4 oz. per bushel gave promising results. A homemade duster is described and directions are given for dusting cottonseed.

**Control of cucumber powdery mildew in greenhouses,** E. F. Guba (*Phytopathology, 18 (1928), No. 10, pp. 847–860, pl. 1, figs. 3*).—Cucumber powdery mildew (*Erysiphe cichoracearum*), a common greenhouse disease in Massachusetts, is readily controlled with fungicides, but their choice requires caution to avoid dangerous combinations with insecticides, and their strength and rate of application require modification to prevent injury. Details are summarized for various media. Copper fungicides and hydrocyanic acid gas are incompatible. Tobacco sprays or fumigants may be used if copper residues are present on the foliage.

**New fungi on the flax** [trans. title], A. N. Klechetov (Kletshetov) (*Zashch. Rast. Vred. (Plant Protect.), [Leningrad], 6 (1929), No. 1–2, pp. 235, 236*).—The author gives the technical description of a fungus, *Helminthosporium linicola* n. sp., which is claimed to differ from *H. lini* as described by Gentner (E. S. R., 51, p. 138). The isolation of three as yet unidentified species of Fusarium found pathogenic on flax is also described.

**Inheritance of resistance in oats to Ustilago levis,** F. A. Coffman, T. R. Stanton, B. B. Bayles, G. A. Wiebe, R. W. Smith, and V. F. Tapke (*Jour. Agr. Research [U. S.], 43 (1931), No. 12, pp. 1085-1099*).—The Markton oat, a variety possessing extreme resistance if not complete immunity to the physiologic strain of *U. levis* used in the experiments, was crossed with the susceptible varieties Early Champion, Ligowa, Scottish Chief, Swedish Select, Iogren, Aurora, Victory, Idamine, and Silvermine, and a study made of the resistance of the progeny.

In seven of the nine crosses, smut-susceptible and heterozygous plants predominated in the $F_2$ generation. In the remaining two crosses, the reverse was true. In three crosses approximately one-fourth of the progeny lines from $F_2$ plants were smut free, and in three others the division was approximately equal. In the $F_3$ the gradation of smut percentages was so complete as to render impracticable a division into genetic classes on the basis of percentage of infection. Correlation was noted in four of the crosses between infection percentages in the $F_3$ and $F_4$, and was especially high in the Markton × Scottish Chief cross. Transgressive inheritance was observed in certain $F_4$ lines where the percentage of infection exceeded that of the susceptible parent. Little or no evidence was noted of correlation between morphological characters and resistance to smut infection.

Doubt is expressed of the existence in Markton of the three factors for resistance to all *U. levis* strains.

**Pathogenicity of Bacillus mesentericus, B. aroideae, B. carotovorus, and B. phytophthorus to potato tubers**, P. Brierley (*Phytopathology, 18 (1928), No. 10, pp. 819–838, pls. 4, fig. 1*).—*B. mesentericus* isolated from a wound rot of potato tubers and inoculated into healthy potatoes at and above 20° C. reproduced the rot. Pathogenicity was retained after heating to 80° for 15 minutes. Three other species pathogenic to tubers, *B. aroideae*, *B. carotovorus*, and *B. phytophthorus*, showed lower minima, optima, and maxima. The four forms are discussed.

**Three Helminthosporium diseases of sugar cane**, J. A. Faris (*Phytopathology 18 (1928), No. 9, pp. 753–774, pl. 1, figs. 5*).—Sugarcane eyespot disease, widely distributed in Cuba, destructive to certain varieties, and previously attributed to *H. sacchari*, does not agree with the helminthosporiose described and figured by Butler and Hafiz (E. S. R., 30, p. 650). The differences are indicated. This eyespot organism is described as a new species and provisionally named *H. ocellum*.

Another Helminthosporium disease of sugarcane, brown stripe, has been found and has been connected with *H. stenospilum*. Cane varieties differ greatly in their susceptibility to the eyespot Helminthosporium and the brown stripe Helminthosporium, both of which are widely distributed in Cuba.

**The effect of a manganese deficiency on the sugar cane plant and its relationship to Pahala blight of sugar cane**, H. A. Lee and J. S. McHargue (*Phytopathology, 18 (1928), No. 9, pp. 775–786, figs. 2*).—Pahala blight of sugarcane, occurring originally near the southern end of the island of Hawaii, has recently been observed at Olaa on Hawaii and at Kilauea on Kauai. A description of the disease and an account of experiments are given. The disease is thought to be identical with tomato chlorosis and described as responsive to soil additions of manganese sulfate by Schreiner and Dawson (E. S. R., 58, p. 210).

Applications of manganese sulfate to the leaves of diseased sugarcane alleviated the disease and later increased growth. Leaves of sugarcane showing severe Pahala blight gave only traces of manganese, leaves showing slight symptoms gave slightly more, and leaves of normal cane showed several times as much. The iron content showed no correlation with Pahala blight.

Both experimentation in cultures and tests in the field support the analytical results, pointing to the absence or deficiency of manganese as a factor correlated with Pahala blight.

**Some sweet potato and tomato diseases and their control**, W. H. Martin (*N. J. State Hort. Soc. Proc., 1929, pp. 169–177*).—Experiments carried on during three years to reduce loss from sweetpotato stem rot and scurf have developed a method, employing organic mercury compounds and offering considerable relief, which is inexpensive and easily applied. In the 1928 experiments, black rot was reduced from 83.3 to 18.1 per cent on sweetpotatoes in infected soil. The 1929 trials and results are tabulated. When used as a dip for sweetpotato sprouts, the organic mercury treatment gave yield increases slightly lower than those obtained with Bordeaux mixture. Procedures are indicated. Sprout treatments do not dispense with the need for seed potato disinfection. A combined treatment, though it will not entirely suppress the disease, will result in a cleaner crop and in many cases higher yields.

The tomato crop is potentially menaced by several diseases, particularly by bacterial spot. The advantages of spraying with 4-4-50 Bordeaux mixture are emphasized.

**The causes and control of damping-off of tomato seedlings,** L. J. Alexander, H. C. Young, and C. M. Kiger (*Ohio Sta. Bul. 496 (1931), pp. 38, figs. 9*).—Of two fungi, namely *Pythium ultimum* and *Rhizoctonia solani*, found causing serious damping-off injury to tomato seedlings, the former caused the greater losses. The seedlings were subject to attack by both fungi from the time the hypocotyl emerged until several weeks old.

*P. ultimum* caused brown, water-soaked lesions, whereas the lesions induced by *R. solani* were not water-soaked and were more or less shriveled, and the cotyledons seriously malformed. *P. ultimum* caused injury at soil temperatures ranging from 15 to 30° C. and at soil moistures varying between 35 and 65 per cent of the water-holding capacity of the soil. Least injury occurred at 30° and at 35 per cent water-holding capacity. *R. solani* operated over a wide soil temperature range but was most destructive at 24° at all soil moisture contents.

No control of damping-off in naturally infested soils was secured by dusting seed with five fungicides, and soaking seed in formaldehyde or in mercuric chloride solutions gave no benefit. Soaking seed in copper sulfate solutions gave fair control. In sterilized soil plus Pythium inoculum or plus Rhizoctonia inoculum, copper sulfate protected seedlings until after emergence. Soil disinfection by the use of copper sulfate, either as a monohydrated dust or as 20-80 copper-lime dust, was unsatisfactory, because when sufficient material was mixed with the soil to control the fungi, seedling injury resulted.

Ceresan-kaolin dust gave some promise as a soil disinfectant, but was slightly toxic to the seedlings. A 20 per cent glacial acetic acid dust and a 10 per cent leaded zinc oxide dust were also toxic to plants. On the other hand, a 6 per cent formaldehyde dust gave excellent control in naturally infested soils or in sterilized soils in which either pathogene was introduced.

**The effect of certain potato and tobacco viruses on tomato plants,** G. Burnett and L. K. Jones (*Washington Col. Sta. Bul. 259 (1931), pp. 37, pls. 6*).—Briefly describing the several virus diseases concerned, the results are presented of cross-inoculation experiments conducted in the greenhouse and in the field. The so-called latent virus was found present in all but one of 655 tubers of six varieties, but was not found in any of 52 seedling potatoes. When potato plants carrying the vein-banding virus were inoculated with the virulent latent virus, symptoms very similar to rugose mosaic were produced. Progeny from the virus-free Early Rose potato when inoculated with rugose mosaic produced typical rugose mosaic symptoms. Early Rose potatoes carrying the vein-banding virus showed a mild type of rugose mosaic when inoculated with material from potatoes affected with crinkle mosaic, leaf roll, or spindle tuber.

The virulent latent virus in combination with crinkle mosaic virus, carrying a mild latent virus, often produced much milder symptoms on tobacco, tomato, or potato than did the virulent latent virus used alone. Latent virus was transferred more readily than was the vein-banding virus. Latent or virulent latent virus was present in tubers showing symptoms of crinkle mosaic, leaf roll, spindle tuber, supermild mosaic, mild mosaic, unmottled curly dwarf, rugose mosaic, and witches' broom. Inoculum from apparently healthy potatoes carrying latent virus and from potatoes carrying leaf roll, spindle tuber, or crinkle mosaic produced similar symptoms in tobacco and tomato. Fresh inoculum from potato plants produced a higher percentage of infection in tomato and tobacco than did dried inoculum. Latent virus alone or combined with tobacco mosaic remained active in dried tomato, tobacco, or potato seedling tissue for at least 46 days. In fact, in dried tomato tissue 20 per cent of infection was obtained after 466 days.

Latent virus appeared to be the only one transmitted mechanically to the tomato or tobacco from apparently healthy, leaf roll, spindle tuber, or crinkle mosaic affected potatoes. Vein-banding virus remained active 46 days in dried tobacco leaf tissue. Under field conditions tobacco mosaic may be spread by both insects and mechanical means and the latent virus by mechanical means only.

**Pathogenesis in the woolly-knot type of crown gall, E. A. Siegler and R. B. Piper** (*Jour. Agr. Research [U. S.], 43 (1931), No. 11, pp. 985–1002, figs. 4*).—The inoculation of new apple grafts at the union with the apple strain of *Bacterium tumefaciens* resulted in the development of malformations in 90 per cent of the trees as compared with only 20 per cent for noninoculated controls. The greater the delay in inoculation after grafting, the less the percentage of infection, indicating that grafts are most susceptible at the time they are first made. Inoculations with the apple strain resulted in malformations which were invariably of the woolly knot type, while inoculations with cultures of the smooth type of gall generally produced malformations of the smooth type.

The immersing one month before grafting of seedling rootstocks in a water suspension of the apple organism resulted in a high percentage of gall formation as compared with rootstocks carefully washed in clear water. Unwashed rootstocks showed more infection than the washed, suggesting that seedlings probably carry surface-borne organisms in quantities sufficient to cause considerable infection, especially when the graft is just made and is most susceptible. The authors suggest that seedlings may act as carriers of the apple strain organism causing woolly knot, and as such should be considered when interpreting the results of control experiments.

**The Phoma fruit spot of the apple, W. H. Martin** (*N. J. State Hort. Soc. Proc., 1929, pp. 57–66*).—Apple fruit spot, reported by Brooks in 1908 (E. S. R., 21, p. 744) as not difficult of control, has been for four years under New Jersey conditions rather consistent in its severity. Extensive studies looking to control in that State during 1927 gave encouraging results. Sulfur, as a dust, as colloidal in liquid form, or as concentrated lime-sulfur, gave no satisfactory control of the fruit spot, though lime-sulfur was better than the other forms of sulfur. On one block receiving six applications of lime-sulfur starting at the seven-day spray, 71.3 per cent of the fruit was clean as compared with 8 per cent on the checks. On an adjoining block, sprayed at the same time with 2–6–50 Bordeaux mixture, 99.5 per cent of the fruit was clean. On one block receiving 2–6–50 Bordeaux mixture at the seventh, seventeenth, and twenty-eighth day and the eleventh week after petal fall, no fruit spot occurred. But copper in both dust and liquid form severely russeted a large part of the fruit.

In the 1929 work, the Bordeaux sprays gave marked improvement from certain of the treatments. The best results came from the four-application series. Since Bordeaux mixture at 1–3–50 was as effective as at 2–6–50, and gives less burning, the lower concentration is recommended. Bordeaux mixture is considered to give the only reliable relief from fruit spots. When the disease has been severe, and a clean-up is desired, at least three applications (17 days, 4 weeks, and 10 weeks after petal fall) are considered necessary. Possibly after a year or two of this clean-up work with Bordeaux mixture, the sulfur sprays may safely be resumed.

**Morphological studies of Leucostoma leucostoma and Valsa japonica, the causal fungi of canker or die-back disease of peach trees,** K. TOGASHI (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 14 (1930), pp. 50, pls. 4*).—Peach canker or die-back, noted as serious in Japan, is said to be connected with *L. leucostoma* and a form of *V. japonica*. This report presents the results of morphological studies on the causal fungi and the comparative studies on the allied fungi from various sources, with a tabular assemblage of their essential biometrical data and details as to differences. "Statistic differences between the sizes of spores and asci alone do not constitute a specific difference."

**Storage rots of cranberries in the 1927 crop,** N. E. STEVENS and H. F. BAIN (*Phytopathology, 18 (1928), No. 9, pp. 809–814, fig. 1*).—Having continued studies begun in 1926 (E. S. R., 61, p. 244), the authors again attempt to measure quantitatively the actual storage rot caused by various fungi in cranberries from different growing regions.

Cranberry storage tests with two varieties of berries from the four principal cranberry-growing regions of the country were carried out in 1927 under the same commercial conditions as in 1926. As compared with 1926, more spoilage developed in 1927 in Massachusetts, New Jersey, and Oregon berries and less in Wisconsin berries. The increase in spoilage of the 1927 berries was due chiefly to an increase in fungus rots, principally those most active at higher temperatures. Holding tests on the bogs, however, indicated that both Massachusetts and New Jersey berries were actually sounder when picked in 1927 than in 1926. The shipping and storage season for cranberries averaged from 4 to 5° F. warmer per day in 1927 than in 1926. Increased spoilage in 1927 is attributed to the warmer season rather than to greater initial infection.

**Powdery mildew of raspberry,** P. D. PETERSON and H. W. JOHNSON (*Phytopathology, 18 (1928), No. 9, pp. 787–796, figs. 2*).—Powdery mildew of raspberries, said to have been first reported in Minnesota in 1923 and epidemic in the Latham variety throughout the State in 1925, 1926, and 1927, is thought to be identical with a disease reported from Ohio, New York, Washington, Connecticut, Illinois, Maryland, Oregon, Indiana, Michigan, and Wisconsin.

The perithecia of this powdery mildew appear to be yet lacking, but it is thought possible that the organism is identical with *Sphaerotheca humuli* on *Rubus* sp. Under field conditions in Minnesota, the mildew is invariably parasitized by *Cicinnobolus cesatii*, and it is thought that this fact may account for the failure to form perithecia. The incidence and effects of the disease are described. Experimentation has shown that the organism can overwinter in infected raspberry buds.

Neither spraying nor dusting controlled the disease in large-scale experiments in 1926. The practice of "clean digging" has been found to eradicate the pathogene successfully from propagative plantings of the Latham red raspberry in Minnesota.

**Virus disease control experiments in black raspberry plantings in 1931,** L. M. COOLEY and W. H. RANKIN (*New York State Sta. Bul. 601 (1931), pp. 6*).—Black raspberry plantings in Erie County were found to contain all five forms of raspberry virus, and very few of the plantations contained less than 25 per cent of diseased plants, with 100 per cent in many instances. Inspections in the summer of 1931 of raspberries imported from Ohio in the spring of 1931, showed a considerable increase in red mosaic, the most serious of the five viruses, as compared with records taken on related stock in Ohio. Variations from 0.09 to 3.16 per cent in the amount of virus in 14 plantations of the Cumberland variety, and from 0 to 1.57 per cent in 8 Plum Farmer plantings, led to the conclusion that the imported stock was being contaminated from outside sources. In eight cases infested red raspberries, both cultivated and escaped seedlings, were found within 50 ft. of the new plats. Wild reds were found the most damaging of all brambles, with some indication that purples and blacks may also serve as sources of infection. Careful isolation is deemed absolutely essential if healthy stocks are to be kept relatively free of red mosaic.

**Germination and cytology of the oospores of Plasmopara viticola** [trans. title], K. Arens (*Jahrb. Wiss. Bot., 70 (1929), No. 1, pp. 57–92, figs. 17*).—The oospores of *P. viticola* are conditioned as to their formation by a checking of the growth of the vegetative mycelium. They may form not alone in autumn but even on the first outbreak, and they occur quite commonly. Low temperatures shorten the resting period. Dryness lengthens it, and if long may also injure the oospores. Their germination occurs between 13 and 33° C., the optimum lying near 25° (77° F.). The deposit of the conidia on the tender parts is probably due to the spattering action of rain. Other phases and changes are outlined. The literature cited ranges from 1876 to 1927.

**Physiological studies on Plasmopara viticola with particular reference to conditions of infection** [trans. title], K. Arens (*Jahrb. Wiss. Bot., 70 (1929), No. 1, pp. 93–157, figs. 19*).—Tests are described and conclusions are detailed at some length regarding conditions for infection by *P. viticola* and the behavior of that organism. In immune plants the germ tubes die, leaving the tissue in an injured state. The view which has been maintained as to a physiological immunity of wine grapes against *P. viticola* is not supported.

**Some diseases of Citrus prevalent in South Africa**, E. M. Doidge (*So. African Jour. Sci., 26 (1929), pp. 320–325*).—The author gives a brief account of diseases and blemishes entailing loss in export of citrus fruit from South Africa, also of recent work done in this connection.

Of organisms attacking citrus fruit the most important economically are *Penicillium digitatum* and *P. italicum*, causing blue mold and green mold, and *Alternaria* spp., studies of which are reported as carried on with *A. citri*, *A. tenuis*, and *A. mali*, and as showing likenesses and differences. Brief details of attempts at wastage control by the use of treated wrappers indicated the need for further experimentation. Diseases due to organisms mentioned as of minor or periodic importance include black rot (*Diplodia natalensis*), brown rot (*?Pythiacystis citrophthora*), sour rot (*Oospora citri-aurantii*), black spot (*Phoma citricarpa*), and anthracnose (*Colletotrichum gloeosporioides*). Blemishes associated with breakdown of the surface cells of the rind and consequent entrance of mold fungi which may be of great importance in the wastage of export fruit include oleocellosis (due to oil liberated on the rind from the oil glands), concentric ring blotch (on trees just starting to bear), and a puffing and grooving of the rind which is ascribed to the effects of drought.

**Wisconsin studies on aster diseases and their control**, L. R. Jones and R. S. Riker (*Wisconsin Sta. Research Bul. 111 (1931), pp. 39, figs. 14*).—The symptoms of aster wilt and of aster yellows are said to be so similar at certain stages as to confuse growers. However, the yellows is a virus disease transmitted by the leafhopper *Cicadula sexnotata*, while the wilt is caused by a parasitic fungus (*Fusarium conglutinans callistephi*). Yellows is said to overwinter in certain biennial and perennial plants, including weeds, and is carried to the young asters by the leafhopper. The wilt overwinters in the soil and on the seed, and once the soil becomes infected it remains so indefinitely.

In respect to control, aster yellows may be prevented by shielding the plants from the leafhoppers by cloth barriers having at least 22 by 22 threads per inch. In order to secure complete protection, it was found necessary to cover the top as well as the sides of such tents.

Substantial progress was made at the station in the development of wilt-resistant asters, and strains of several different colors were obtained. These new asters were submitted for tests over a wide range from New York to California and found satisfactory, indicating that there is essentially one type of pathogene concerned and that disease expression is not sufficiently affected by environment to overcome established resistance.

In a small way seed disinfection and the use of disease-free soil may enable home gardeners to overcome the wilt disease, but real hope appears to lie in the use of resistant varieties.

**Preliminary studies of the life history of Erostrotheca multiformis, the perfect stage of Cladosporium album Dowson,** G. H. Martin and V. K. Charles (*Phytopathology, 18 (1928), No. 10, pp. 839–846, pls. 5*).—A disease of the sweet pea (*Lathyrus odoratus*) recently recorded for this country is stated to be identical with *C. album* described by Dowson for England in 1924 (E. S. R., 53, p. 49), and said to have been recorded for America in 1927. White blight is suggested as the common name for this disease.

The perfect stage was developed in culture media and is described as the new species *E. multiformis*. The fungus has many different spore forms, each capable of starting a new infection. Pseudosclerotia on the necrotic leaf spots can spread the disease. This fungus is claimed to be distributed in England and in Massachusetts, New York, and Pennsylvania.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Known and potential results of bird and animal introduction with especial reference to California,** T. I. Storer (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 4, pp. 267–273, figs. 3*).—This account includes a list of animals, other than insects or animal parasites, known to have become naturalized in parts of California.

**A method of staining the oocysts of coccidia,** H. B. Crouch and E. R. Becker (*Science, 73 (1931), No. 1886, pp. 212, 213*).—The authors describe a technic which they have found to be extremely useful in their researches on coccidia.

**[Contributions on economic entomology]** (*Calif. Dept. Agr. Mo. Bul., 19 (1930), No. 6, pp. 389–408, figs. 11; pp. 409–421, figs. 4; pp. 437, 438, fig. 1; pp. 452–455*).—The papers here presented are as follows: The Oil Emulsions, a Brief Survey, by A. C. Browne (pp. 389–408); The Lima Bean Pod-Borer in California, by S. E. Flanders (pp. 409–421); To Burn or Not to Burn American Foulbrood—a Burning Question, by H. M. Melbee (pp. 437, 438); Red Spider or Pacific Mite [*Tetranychus pacificus* McG.] in San Joaquin County, by A. E. Mahoney (pp. 452, 453); and A Practical Key to the Species of Termites Found in California, by S. F. Light (pp. 454, 455).

**[Contributions on economic entomology]** (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 6, pp. 363–370, figs. 7; pp. 373–382, figs. 3; pp. 384–388, figs. 5; pp. 389–391*).—The contributions here presented are as follows: Pink Bollworm Scouting Methods, by R. W. White; The Diffusion of Hydrocyanic Acid Gas, by G. P. Gray and A. F. Kirkpatrick; Control of the Walnut Fly [*Rhagoletis completa* (Cress.)], by D. B. Mackie and C. Gammon; and Heat Treatment of Apples for Mealybug Control, by A. C. Browne.

**Miscellaneous insect notes and descriptions, H. H. Keifer** (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 5, p. 345*).—The author records the collection of *Scirtothrips longipennis* (Bagn.) in San Francisco in February, 1931, where it was said to be very harmful to *Ficus elastica* in greenhouses. The range of the Italian pear scale (*Diaspis piricola* (Del G.)), well known as an orchard pest and occurring on various rosaceous trees and shrubs, up to the present is apparently the San Francisco Bay region and the coast to the south.

**Annual report of the department of zoology and entomology, R. W. Harned** (*Mississippi Sta. Rpt. 1931, pp. 30–35*).—An account is first given of studies by L. E. Myers of the biology of the Japanese mealybug *Pseudococcus kraunhiae* and the Mexican mealybug *Phenacoccus gossypii* under glasshouse conditions on coleus, a preferred host for both species. In a study of *P. kraunhiae* commenced May 18, 1930, and of *P. gossypii* July 26, seven life cycles of from 38 to 57 days' duration were found to be completed by the former in 10 months and five life cycles of from 42 to 57 days by the latter in 8 months. The oviposition period of the former varied from 5 to 23 days with the number of eggs varying from 53 to 592, the oviposition of the latter from 6 to 14 days with the number of eggs varying from 225 to 500.

With two plants, upon each of which a mature female was placed, that infested with *P. gossypii* was more heavily infested, this species being the more prolific. It also showed the most dwarfing and died or first wilted 36 days after the first egg had been laid, as compared with 48 days for that infested with *P. kraunhiae*. In several experiments conducted with a view to determining the effect of fumigation upon different stages of the insect with no consideration as to the effect upon the plant, it was found that 5 lbs. of carbon disulfide to 2,000 cu. ft. of air space destroyed the eggs in all stages as did calcium cyanide used at the rate of 1 lb. to 1,000 cu. ft. of air space. There was no kill of the third or adult stage. The plants were killed by both of the fumigants. The use of nicotine sulfate 1.5 oz. to 2,000 cu. ft. of air space resulted in the kill of 100 per cent of the first stage up to 4 days of age, of 88 per cent from 4 days to the second stage, and 50 per cent kill of the eggs, while the leaves of the plant showed some burning.

In work by J. M. Langston on the pecan weevil, due to unfavorable weather conditions but a single adult weevil was reared from the 1928–1930 brood and no parasites appeared in the brood (1929–1931) which followed. In the fall of 1930 hickory nuts were found to be 19.8 per cent infested with weevil larvae, and for the first time eggs and very small larvae were found in pecans. These larvae molted three times during the 18 days of their development from hatching until the larvae were full grown and left the nuts to enter the soil. In some control experiments, covering shucks infested with shuckworms in the spring reduced the number of adults emerging from 21 per cent in the checks to 1.3 per cent in the control cages. Examination of pecan shucks of the 1929 crop showed 62.2 per cent parasitism, and 77 per cent of the parasites had emerged by March 25, 1930. Weekly collections of pecan drops showed 15.9 per cent of those from a seedling tree near some hickory trees infested with shuckworms, while only 1.08 per cent of the drops from grove trees 150 yds. from hickories were infested. Only two generations of the pecan budmoth were noted, no larvae being found after July 10, 1930, due probably to the unusual dry weather during the summer of 1930.

A note by A. L. Hammer on the cotton aphid project is included.

**[Report of the division of entomology], R. L. Webster et al.** (*Washington Col. Sta. Bul. 260 (1931), pp. 32–34*).—A study by A. Spuler of codling moth control dealt with the relative effectiveness of the various brands of lead arsenate used in the Northwest when applied alone or in combination with other insecticides. From the standpoint of the codling moth control no significant differences were found, but when compared on the basis of arsenical deposit significant differences appeared. In seasonal tests made to determine the loss of spray coverage through agencies such as weathering, apple growth, etc., between sprays, it was found that the rate of loss per day was greatest during the fore part of the season, indicating that apple growth is the chief factor responsible for coverage loss. The tests further indicated that the percentage of daily loss of deposit was not affected whether lead arsenate was used alone or in combination with other materials such as mineral oils, spreaders, or fish oils. Film type coverage was found to be more effective than the spot or blotch type. The spreaders used were not the calcium caseinate spreaders previously employed, but commercial spreaders of the colloidal type designed to produce film coverage without appreciably lowering arsenical deposit. The addition of these materials to lead arsenate improved its insecticidal value in every case, being of the greatest benefit when used with those brands of lead arsenate containing a deflocculating agent.

Fish oil when used in combination with lead arsenate was found to be very effective in controlling the codling moth. This combination where lead arsenate was used at 2 lbs. per 100 gal. was more effective than lead arsenate used alone at 3 lbs. per 100 gal. Fish oil was also found to possess an ovicidal value almost equal to mineral oil when used in the same concentration. Some difficulty was experienced in keeping the oil in suspension where deflocculator brands of lead arsenate were used, and this incompatibility was reflected in a lowering of arsenical deposit left on the fruit. However, the fish oil-lead arsenate combination, if used in any of the late sprays of the season, complicates the fruit cleaning problem.

In a series of spray programs that which came nearest to meeting all the requirements consisted of a calyx spray of lead arsenate 3 to 100; first cover, mineral oil-lead arsenate 2 to 100; second and third covers, fish oil-lead arsenate 2 to 100; fourth cover, lead arsenate 3 to 100; and fifth and sixth covers, mineral oil-nicotine. The leaves showed little or no burning, and were free from leafhopper or red spider injury. The residue arsenical load was 0.061 as compared with 0.078 for the straight lead arsenate plat. Although the cost of the spray material was greater than that of the straight lead arsenate program, the net gain from the special sprayed plat was greater than that of the lead arsenate plat because of more effective worm control.

The boxelder bug, which caused considerable damage to the apple crop in the vicinity of Peshastin, was found by Spuler to feed on the fruit and not on the apple foliage. The injury to the fruit was not visible on the surface, but by halving an apple that had been punctured a darkened area surrounding each puncture appeared on the flesh of the apple just beneath the skin. These areas extended to a depth of from ¼ to ⅜ in. and were sometimes continuous where the punctures were numerous. Of the several contact poisons applied as sprays experimentally, it was found that an extract of pyrethrum 1 to 400 with whale-oil soap 0.25 to 100 gave best results. The insects were stupefied by the spray and almost as soon as they were hit dropped to the ground to succumb.

In combating several species of red spiders very common in the fruit districts of the State, summer oils having a viscosity of 70 or higher used at the rate of 1.5 gal. per 100 were found by Spuler to be effective against the European red mite and clover mite as a summer treatment. The two-spotted mite or common red spider, which overwinters in the soil or under bark or other rubbish, proved to be the most destructive and the most difficult to control.

Summer oils were not generally effective against this pest unless combined with a good spreader or applied when the spiders first appear and before much webbing is produced. Lime-sulfur applications in the pink or calyx spray for mildew control were effective in checking the work of the two-spotted mite throughout the season.

**Report of the Government entomologist [of Jamaica],** W. H. Edwards (*Jamaica Dept. Agr. Ann. Rpt. 1930, pp. 20, 21*).—This annual report includes a brief account of work with insecticides and a list of the more important insect pests dealt with during the year.

**[Work with economic insects in the Philippine Islands],** S. Youngberg (*Philippine Bur. Agr. Ann. Rpt., 28 (1928), pp. 67–75, pls. 6*).—A brief account is given of the locust-control campaign and of the occurrence of and control work with other important insect pests of the year.

**Annual report of the entomologist, Research Bureau, Philippine Sugar Association, 1929–30,** A. W. Lopez (*Philippine Sugar Assoc., Research Bur., Ann. Rpt. Ent., 1929–30, pp. 145–172, pls. 5, figs. 5*).—This report deals largely with studies of the buc-an and allied cane root grubs, namely, *Leucopholis irrorata* Chevr.; *Lepidiota*, probably *pruinosa* Burm.; and *Holotrichia*, probably *vidua* Shp. *L. irrorata*, the most destructive and widespread species, is found in practically all soil types, although it prefers the lighter textured soils. Details of the life history studies are presented in tabular form.

**Report of the entomologist,** C. B. R. King (*Tea Research Inst. Ceylon Bul. 5 (1930), pp. 17–20*).—This report deals particularly with studies of the life histories of several of the nettle grubs and with control work with *Trichogramma erosicornis*.

**Insects infesting legumes in Bahia** [trans. title], G. Bondar (*Bol. Lab. Path. Veg. [Bahia], No. 9 (1930), pp. 83+III, figs. 30*).—An account of the legumes cultivated in Bahia (pp. 3–12) is followed by a discussion of their important enemies, particularly insects.

**Mushroom insects: Biology and control,** C. A. Thomas (*Pennsylvania Sta. Bul. 270 (1931), pp. 42, figs. 21*).—The author here presents a summary of present knowledge concerning mushroom insect pests, including control measures. The information is said to have been obtained from personal experimental work, published contributions by other investigators, and from spawn producers and mushroom growers. Ten species are listed as of major importance, namely, the mushroom mite (*Tyroglyphus lintneri* Osb.), long-legged mite (*Linopodes antennaepes* Banks), mushroom springtail (*Achorutes armatus* Nic.), silvery springtail (*Lepidocyrtus cyaneus* Tullb.), four fungus gnats (*Neosciara pauciseta* Felt, *Sciara coprophila* Lintner, *S. multiseta* Felt, and *S. agraria* Felt), and two manure flies (*Aphiochaeta albidihalteris* Felt and *A. agarici* Lintner). As minor pests, mention is made of eelworms (Nematoda), which may occasionally be injurious; sowbugs, including *Porcellio laevis* Koch and related species (Crustacea), the "looper" caterpillar *Metalectra quadrisignata* Walk. (Noctuidae), and gall gnats of the family Cecidomyiidae or Itonididae. Following a key to the injuries caused by these pests, the prevention of infestation and general methods of control, the pests, including their natural enemies, control measures, etc., are considered at some length. A bibliography of 53 titles is included.

**[Work with cranberry insects at the Cranberry Substation],** D. J. Crowley (*Washington Col. Sta. Bul. 260 (1931), pp. 66–68*).—A brief report is made of dormant spray experiments for the control of the oyster-shell scale and Putnam's scale. In applications made February 2 at the rate of 900 gal. per acre good control was obtained in plats where Kleenup Miscible Oil 3.5 per cent and Standard Oil No. 7 emulsified with "cresoap" were used. Equally good control is said to have been obtained in a plat treated with lime-sulfur. All the oils used gave a high percentage kill of the fireworm eggs, but the hatch on the lime-sulfur plat was normal. Injury to buds was about 25 per cent more in the plat sprayed with Orthol K Medium than in the plats sprayed with Kleenup Miscible or Standard Oil No. 7, where the injury was not serious. The percentage kill of fireworm eggs was as high in the plat sprayed with Orthol K Medium as in the plats where the heavier oils were used.

In field tests in which applications of miscible oils at 2 and 3 per cent actual oil content were made the first week in February, no injury to the buds was noted in plats sprayed with the 2 per cent oil, while about 10 per cent injury was the average in the acreage sprayed with the 3 per cent strength. The average kill of fireworm eggs was about 75 per cent where the 2 per cent oil was applied and about 80 per cent where the 3 per cent was used. Oils of the same viscosity as the above when applied in a quick-breaking emulsion gave serious injury in all plats; in some the injury amounted to 75 per cent of all fruit buds. It is concluded that a 2 per cent miscible oil spray applied in January or February and in sufficient quantities to wet the undersides of the cranberry leaves is very valuable for control of the cranberry fireworm.

In work with summer sprays no advantage was observed in the use of the miscible oil as a summer spray over the quick-breaking type. Good control of oyster-shell scale in the migratory stage was obtained as in the previous tests by the use of nicotine-oil or pyrethrum-oil combinations. This proved to be the most satisfactory method for controlling oyster-shell scale in the cranberry bogs. More than 1 per cent oil applied when the berries are just set will cause a high percentage to shrivel or drop. All the commercial oils tested during the season were found satisfactory for use in combination with nicotine or pyrethrum.

In work with spreaders or stickers, used with most sprays, crystal potassium oleate was found to be the best spreader used with nicotine sulfate. Better results were obtained where nicotine and crystal potassium oleate were used than where nicotine and fish-oil soap or nicotine with other combinations was used.

Reporting upon pyrethrum sprays, it is stated that at least two-thirds of the local cranberry bogs were sprayed during the season with pyrethrum. Better results were obtained where Evergreen was used by adding a 1 per cent oil emulsion and a quart of Del Monte spreader to each 100 gal. of spray. Fish oil as a spreader gave poor results both with lead arsenate and barium fluosilicate. Berries in the plats where fish oil was used were blemished and in some cases deformed. Where the fish oil was emulsified by adding cresoap no injury was noted.

In control work with the cranberry fruit worm, in which the egg parasite *Trichogramma minutum* Riley was liberated on the bogs, only about 10 per cent of the eggs appeared to be parasitized under control conditions, due primarily to their inability to penetrate and oviposit within the fruit worm eggs. The best results from insecticides were obtained by spraying with Evergreen 1 to 400 plus 0.75 per cent summer oil or with nicotine 1 to 400 plus 16 lbs. of crystal potassium oleate soap when the moths were emerging during July.

**Handbook of citrus insect control for 1931,** R. S. Woglum et al. (*Calif. Fruit Growers Exch., Los Angeles, Bul. 8* (*1931*), *pp.* [*1*]+*24*).—This is a revision of the accounts previously noted (E. S. R., 64, p. 242).

**Chemistry of oil sprays,** K. Groves and J. L. St. John (*Washington Col. Sta. Bul. 260* (*1931*), *p. 22*).—Variations in the properties of the minerals used in spray combinations were found to be insufficient to account for any differences in soluble arsenic formation, these apparently being due to a variation in the amount of ammonia present in the emulsifier. In a study of the effect of ammonia on commercial lead arsenates, it was found that the ratio of the quantity of ammonia present to the soluble arsenic formed is a constant. The soluble arsenic content of an oil spray combination can be estimated if the ammonia content is known.

**Fumigation research in Florida,** A. F. Camp and R. J. Wilmot (*Fla. State Plant Bd. Mo. Bul., 15 (1930–31), No. 5–8, pp. 1–35, figs. 27*).—An investigation of fumigation, applied as a quarantine measure, of nursery stock, etc., showed failure to obtain insect kill to be primarily due to low concentrations of the gas. "Further investigations showed that the low concentrations are largely due to leakage of the gas out of the fumigatorium and to absorption by the load, both of these losses being very large. Irregular results in obtaining insect control were found to be due largely to a lack of penetration of the gas into the load. Methods of offsetting these difficulties are reported, including a metal fumigatorium with an agitating system and a fractional method of applying the fumigant so as to compensate for absorption."

**Report on some tests of the use of a new cyanogen product in ship fumigation,** C. L. Williams (*Pub. Health Rpts. [U. S.], 46 (1931), No. 35, pp. 2048–2059, pls. 2*).—On the basis of tests conducted there is said to be little to choose between hydrogen cyanide discoids and Zyklon for the purpose of fumigation of ships.

**The air jet hydrocyanic acid sprayer,** C. L. Williams (*Pub. Health Rpts. [U. S.], 46 (1931), No. 30, pp. 1755–1761, pls. 2, fig. 1*).—The author reports upon the use of the air jet sprayer for the application of hydrocyanic acid. The apparatus works well over a considerable range of pressures, but is most effective when the HCN is supplied under a pressure of from 75 to 100 lbs. and the air from 100 to 200 lbs.

**Experiments with certain fumigants used for the destruction of cockroaches,** J. R. Ridlon (*Pub. Health Rpts. [U. S.], 46 (1931), No. 28, pp. 1623–1636*).—The details of fumigation work with cockroaches are presented in tabular form. It was found that Zyklon-B and liquid hydrocyanic acid with 5 per cent chloropicrin probably have equal lethal effect and are effective in killing roaches in the proportion of 60 gm per 1,000 cu. ft. during a 2-hour period, which is the usual time of exposure for an empty vessel.

**Effect of fumigation on cockroaches on ships,** C. L. Williams (*Pub. Health Rpts. [U. S.], 46 (1931), No. 29, pp. 1680–1694*).—The details of fumigation with liquid hydrocyanic acid against *Blatella germanica* are reported, principally in tabular form.

**The bionomics of some Malayan Rhynchota (Hemiptera-Heteroptera),** N. C. E. Miller (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 5 (1931), pp. [1]+142, figs. 142*).—Among the more important Heteroptera noted are *Brachyplatys subaeneus* Westw., attacking several leguminous plants; *Eusarcocoris ventralis* Westw. and *Antestia degenera* Walk., attacking rice; *Eurydema pulchrum* Westw., attacking kohlrabi and mustard; the southern green stinkbug (*Nezara viridula* L.), attacking plants belonging to at least 17 families comprising 35 species; *N. viridula* L. *torquata* F., attacking *Crotalaria striata; Piezodorus rubrofasciatus* F., attacking legumes; *Menida varipennis* West., attacking rice; *Pycanum ponderosum* Stål, found attacking several garden plants; *Tetroda histeroides* F., attacking rice and occasionally kapok; *Derepteryx chinai* n. sp., attacking two species of wild raspberry; *Ochrochira rubrotincta* n. sp., *Anoplocnemis phasiana* F., and *Acanthocoris scabrator* F., which attack several host plants; *Cletus punctiger* Dall., attacking rice and sugarcane; *C. trigonus* Thunb., attacking widely separated genera of plants of Gramineae and Amarantaceae; and *Riptortus linearis* F. and *R. pedestris* F., both attacking a number of important host plants.

A list is given of the plant hosts with the English and Malayan common names, followed by a list of 72 references to the literature.

**Cold storage as a means of destroying mealybugs on fruit,** A. C. Browne (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 3, pp. 219–229, figs. 3*).—This is a review of the present status of knowledge of the subject.

**Field key for the determination of some of the common mealybugs infesting nursery stock in California,** A. J. Basinger (*Calif. Dept. Agr. Mo. Bul. 20 (1931), No. 2, pp. 189–193, figs. 8*).—This contribution from the California Citrus Experiment Station, consisting of an annotated key to the mealybugs commonly found infesting nursery stock in California, is accompanied by a photographic reproduction of each of the eight species.

**A report of the coccids infesting avocados in California, with special reference to Chrysomphalus dictyospermi (Morgan),** D. B. Mackie (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 7, pp. 419–441, figs. 4*).—The author presents the results of a survey to determine the relative numerical abundance of this and other coccids attacking avocados in San Diego, Orange, Los Angeles, Ventura, Santa Barbara, San Bernardino, and Riverside Counties, an area comprising practically all commercial avocado plantings in the State.

**The Indian pod borer,** D. B. Mackie (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 3, pp. 234, 235, fig. 1*).—An account of a very destructive pyralid moth borer, *Maruca testulalis* Gey, which has been introduced from the Orient and become naturalized in Cuba and which has transferred its attention from the mungo bean to the Lima bean. In its new home the pest is perhaps the greatest detriment to the more extensive culture of this bean of any species of insect known.

**The pistol-case bearer,** E. Gould (*West Virginia Sta. Bul. 246 (1931), pp. 12, figs. 10*).—This is a report of a study conducted largely in the spring of 1929 of the life history and control of the pistol case bearer, which first came to the attention of the station in the season of 1927 when it began to assume serious proportions in an orchard near Charles Town, W. Va. The pest has since increased to such an extent in certain orchards in the eastern panhandle of the State as to rival the codling moth in destructiveness.

A list is given of 11 forms of parasites reared from the pest, several of which appear to be new to science. It has been found very difficult to control, the usual spray program, even with modifications of the materials used, having thus far failed. It was found that a degree of control which probably will at least prevent its increase in abundance has been secured by the use of a combination of nicotine sulfate, 1 part to 800 parts of water, with 0.5 per cent Penetrol, applied just after the hatching of the eggs in July. It is pointed out that the utmost thoroughness in the application of this material has been found to be necessary if a satisfactory degree of control is to be obtained. It is recommended that special sprays to keep down the numbers of the insects be applied in orchards where it seems to be increasing although not yet present in destructive numbers.

**Preliminary report upon the infestation and general status of the European corn borer in western New York,** H. N. Bartley and L. B. Scott (*U. S. Dept. Agr. Circ. 197 (1931), pp. 22, figs. 2*).—This circular is said to have been prepared in response to many requests for information concerning the annual changes in intensity of the European corn borer infestation in the western New

York area. Following a brief introduction and a history of the western New York infestation, accounts are given of the method of making infestation records, including the infestation of corn plant, corn stubble, and corn ears; the progress of infestation, 1920 to 1929, inclusive; seasonal planting; establishment of larvae; and host plants listed in western New York, 1920–1929.

The findings fail to indicate that any type or variety of corn is particularly susceptible to corn borer attack, although it appears that early planted corn, regardless of the type and variety, is more severely attacked than corn planted in late May and early June. Preliminary observations made during 1926 and 1927 indicated that approximately 15 full-grown larvae were produced from every 100 eggs deposited.

**Damage to tomatoes in southern California by the tomato pin worm and the potato tuber moth,** R. E. CAMPBELL and J. C. ELMORE (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 7, pp. 458–460*).—This is an account of damage by *Gnorimoschema lycopersicella* Busck, commonly known in California as the "pinworm," which has leaf mining, leaf folding, and stem boring habits but does far greater damage to tomatoes by injuring the fruit. This injury to fruit, consisting of small "pinholes," is produced by the young larvae. The eggs are laid singly or in clusters of from three to six on the leaves and fruit, into which, soon after hatching, the larvae bore. In case of leaf injury the young larva acts at first purely as a leaf miner. After a few days the diameter of the larva becomes greater than the thickness of the leaf and it emerges from the mine, rolls or folds an edge, or the whole leaf, and feeds within the fold. In the case of fruit injury, the larva apparently enters near the spot where the egg was deposited, causing the pinhole. The larvae have also been observed boring in tomato stems late in the season where infestations have become very heavy.

No satisfactory control measure has as yet been discovered.

**The control of the cutworm,** H. WILKINSON (*Kenya Colony Dept. Agr. Bul. 12 (1931), pp. 5*).—A brief practical account.

**A substitute for lead arsenate,** D. J. NEWCOMER (*Better Fruit, 25 (1931), No. 10, pp. 7, 8*).—Attention is called to the value of fluorine compounds in combating the codling moth, several having proved equal to lead arsenate, of which barium fluosilicate and cryolite are available in a form suitable for use.

**A comparison of the effect of various substances upon larvae of Aedes aegypti,** R. C. SHANNON and M. FROBISHER, JR. (*Amer. Jour. Hyg., 14 (1931), No. 2, pp. 426–432*).—The effects of over 50 substances, tested by placing larvae of the yellow fever mosquito in various concentrations of the test substances and observing the length of time required for death to ensue, are reported upon in tabular form.

**Water courses as a possible element in the early spread of the walnut husk-fly in southern California,** K. L. WOLFF (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 3, pp. 230–233, fig. 1*).—A general discussion of the subject in which it is suggested that flood waters rushing down from the San Gabriel Mountains may have been responsible for the original distribution of the pupae of the walnut husk fly *Rhagoletis suavis completa* Cress. in walnut orchards of Los Angeles and San Bernardino Counties.

**Typhus fever: A virus of the typhus type derived from fleas collected from wild rats,** R. E. DYER, A. RUMREICH, and L. F. BADGER (*Pub. Health Rpts. [U. S.], 46 (1931), No. 7, pp. 334–338*).—"Inoculation into guinea pigs of fleas removed from rats which had been trapped at a typhus focus resulted in the establishment of a strain of virus which produced a typhus-like reaction in guinea pigs. Monkeys and rabbits developed agglutinins for *B[acillus]* *proteus* $X_{19}$ (type O) following inoculation with this strain of virus. Guinea pigs which had recovered from an attack of endemic typhus produced by the Wilmington strain of virus were apparently immune to a subsequent inoculation with the strain of virus recovered from the fleas."

**Typhus fever: The rat flea, Xenopsylla cheopis, in experimental transmission,** R. E. Dyer, A. Rumreich, and L. F. Badger (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 32, pp. 1869, 1870*).—The experiments here reported confirm the earlier findings of the authors incriminating the oriental rat flea, as above noted.

**The Mexican bean beetle in Connecticut,** R. B. Friend and N. Turner (*Connecticut State Sta. Bul. 332* (*1931*), *pp. 71–108, figs. 14*).—This general account of the Mexican bean beetle in Connecticut is based upon a review of the literature, in connection with a list of 35 references, and biological and control studies conducted by the authors in 1931.

The studies have shown that the adult leaves its hibernating quarters late in May and early in June and lays its eggs on the leaves of bean plants. Both adults and larvae feed extensively on the foliage. The total development period from egg to adult requires from 33 to 39 days, and the total larval period is from 19 to 22 days in duration. The first generation of adults occurs from the middle of July until the last of August, and the second generation of adults occurs from the first of September until frost. These second generation adults hibernate under litter near the bean fields. A partial third generation may develop.

The climatic conditions in Connecticut appear to be favorable to the life of the bean beetle, and an abundant food supply is available. Certain parasitic and predacious enemies prey upon the beetles to a limited extent, but no great degree of control is exercised. Cultural methods and insecticides must be relied upon to protect the plants. It is concluded that when properly applied magnesium arsenate, either as a spray or dust, and barium fluosilicate, applied as a dust, will give good results. Other commonly used arsenicals injure bean foliage. The use of pyrethrum-soap sprays is recommended under certain conditions.

Brief mention is made of other insects injurious to the foliage of beans.

**Dusting for boll weevil control,** C. H. Brannon (*N. C. Agr. Col. Ext. Circ. 186* (*1931*), *pp. 8, figs. 6*).—This is a practical account.

**The control of fire ants in the Lower Rio Grande Valley,** S. W. Clark (*Texas Sta. Bul. 435* (*1931*), *pp. 12, figs. 4*).—The fire ant, which ranges from the south and southwestern United States into tropical America and on the Pacific coast northward into British Columbia, causes severe injury to young citrus trees throughout the whole Lower Rio Grande Valley. In the investigations here reported calcium cyanide dust applied to the nests gave a good measure of control, although there is some danger to the tree where the nests are close to the base and when the material is in the hands of inexperienced or careless operators. Poisoned baits, utilizing arsenicals as the active poison ingredient, were found ineffective under the conditions of the tests. Crude carbolic acid, creosote, and creolin compounds are not recommended by the author for use in protecting citrus trees from ants. Poisoned bait, incorporating thallium sulfate as the active poison, was very effective in the control of the ant under the conditions of the experiments. It is pointed out that the percentage of poison in the sirup recommended (2 oz. per gallon of sugar sirup) is the lowest which should be used to obtain satisfactory control, and that extermination may be hastened by increasing the percentage of poison. After the ants have been killed the wounded areas of the trees should be cleaned and Bordeaux paint applied. Particular care should be exercised in handling the thallium sulfate, which is a deadly poison and should not be placed where children or animals may have access to it.

**Rocky Mountain spotted fever (eastern type): Transmission by the American dog tick (Dermacentor variabilis)**, R. E. DYER, L. F. BADGER, and A. RUMREICH (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 24*, *pp. 1403–1413*, *figs. 7*).—The authors' studies have led to the conclusion that the virus of the eastern type of Rocky Mountain spotted fever is preserved in the body of the American dog tick through at least one month.

**Expansion of investigations on tick-borne diseases by the United States Public Health Service**, R. R. SPENCER (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 36*, *pp. 2097–2101*).—In this review of the work under way it is pointed out that *Dermacentor andersoni* transmits to man by its bite no less than four diseases, including Rocky Mountain spotted fever, tularemia, tick paralysis, and Colorado tick fever.

**Notes on ticks and tick eradication** (*Kenya Colony* [*Dept. Agr.*] *Bul. 13* (*1931*), *pp. 16*).—An account of the ticks common in Nairobi and their eradication through dipping.

## ANIMAL PRODUCTION

**[Nutrition studies at the Washington Station]** (*Washington Col. Sta. Bul. 260* (*1931*), *pp. 19, 20, 23, 24*).—The results of two studies are noted.

*The biological value of the proteins of alfalfa leaves and stems and digestion coefficients of nutrients in stems and leaves*, J. Sotola.—Additional information dealing with the composition and digestibility of second-cutting alfalfa hay has been obtained in this study, using the same procedure as in work previously noted (E. S. R., 64, p. 656).

*Poultry nutrition*, J. L. St. John, O. Johnson, C. Kempf, and H. Gerritz.—No variations in the endogenous and metabolic nitrogen were found during the first 12 weeks of a chick's life that could be correlated with age. Feeding chicks a basal ration with a high biological value and supplementing with fish meals showed that 15 per cent of protein furnished from this source was the most efficient level, with 12 per cent of protein practically as efficient. For maximum growth during the first 10 to 12 weeks of age, a protein level of 15 per cent should be used. There were indications of a definite relationship between the protein level in the feed, the date of sexual maturity, and the size of eggs produced. The calcium-phosphorus balance of the basal ration when no added minerals were fed was negative, and the addition of high levels of calcium and phosphorus did not increase the balance over moderate levels.

**Inspection of commercial feeding stuffs, 1931**, T. G. PHILLIPS, T. O. SMITH, and S. J. FISHER (*New Hampshire Sta. Bul. 259* (*1931*), *pp. 60*).—The usual report is given of the guaranteed and found analyses of samples of 390 brands of feeding stuffs collected in the official inspection for the year ended May, 1931 (E. S. R., 64, p. 366).

**Commercial feeding stuffs, September 1, 1930, to August 31, 1931**, F. D. FULLER, J. SULLIVAN, and S. D. PEARCE (*Texas Sta. Bul. 440* (*1931*), *pp. 205*).—The guaranteed and found analyses and the results of microscopic examination of 2,703 samples of feeding stuffs officially inspected during the year ended August 31, 1931, are given (E. S. R., 64, p. 757).

**Tame versus native pastures, 1931**, E. E. JACOBS ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 35* (*1932*), *pp. 8–12*).—Continuing this study (E. S. R., 65, p. 362), two Holstein heifers were placed on native pasture on June 6. On account of a poor start in the Sudan grass pasture heifers were not turned on it until July 6. Both lots were continued on pasture to September 13. The heifers on native pasture made low but consistent gains, while the heifers on Sudan grass made much more rapid as well as consistent gains. The native pasture produced 18.5 lbs. of gain per acre and the Sudan grass 36.9 lbs. per acre.

**Effects of chlorophyll on animals** (*Georgia Sta. Rpt. 1931, p. 32*).—White rats were divided into 3 lots of 6 each and were fed a basal ration free from chlorophyll for 56 days. No additions were made to the ration of lot 1, the check lot, while in lot 2 10 mg and in lot 3 30 mg of purified chlorophyll were added to the ration of each rat daily. The results did not show any material or striking effect from the use of chlorophyll in the ration, although there were indications that less feed was consumed per unit of gain in lots receiving chlorophyll. Apparently most or all of the chlorophyll was passed out through the feces, probably after changes by the digestive juices.

**The fasting metabolism of cattle as a base value of heat production in the determination of the net energy of feeding stuffs,** E. B. FORBES, W. W. BRAMAN, M. KRISS, R. W. SWIFT, ET AL. (*Jour. Agr. Research [U. S.], 43 (1931), No. 11, pp. 1003–1014, figs. 2*).—A series of seven fasting experiments was conducted with two steers at the Pennsylvania Institute of Animal Nutrition. One steer was subjected to fasting four times and the other three times at intervals varying from 4 to 6 weeks. The fasting periods were of from 3 to 6 days' duration, and each period was preceded by a preliminary period of at least 9 days during which the animals were kept on a plane of energy equilibrium. Alfalfa hay and corn meal were fed to one steer during the preliminary period and corn meal alone to the other steer. The animals were kept in a respiration calorimeter during the last 2 to 5 days of the fasting period and were given water, but no salt or other mineral nutriment. At the end of the experiment the steers were killed, the contents of the alimentary tract removed and weighed, and the area of the hide measured. Heat production was measured by direct calorimetry, checked by determination of the heat by the respiratory-quotient procedure.

Heat production generally decreased continuously as the fast progressed, and no definite constant level of heat production was reached. If the routine measurement of heat production of fast is arbitrarily standardized as the heat production of the first 24 hours after the attainment of nonprotein respiratory quotient of fat, following the establishment of a protein and energy equilibrium, it appears that true fast may be attained as early as the second day after the withdrawal of food and is certainly attained by the fourth day.

**The metabolizable energy and net energy values of corn meal when fed exclusively and in combination with alfalfa hay,** E. B. FORBES, W. W. BRAMAN, M. KRISS, R. W. SWIFT, ET AL. (*Jour. Agr. Research [U. S.], 43 (1931), No. 11, pp. 1015–1026*).—The purpose of this study, conducted at the Pennsylvania Institute of Animal Nutrition, was to determine whether the energy value of a ration was equal to the sum of the separately determined energy values of its components. Metabolism studies were made with two steers and consisted of two maintenance periods on alfalfa hay alone, one maintenance period on corn meal alone, and one maintenance period on equal parts of alfalfa hay and corn meal.

It was found that the metabolizable energy value of corn meal was practically the same whether fed alone or in combination with alfalfa hay, but the heat increment value of the corn meal was much greater when fed alone than when fed in the mixed ration. These results mean that the net energy value of corn meal in the mixed ration was greater than when fed alone, These results indicate that the net energy value of a feeding stuff may differ according to the proportion in which it is incorporated in the ration.

These results were interpreted to mean that the determination of consistent net energy values would require the presence of all nutrients, except those used for energy production, in optimum quantities and proportions.

**Beef cattle experiments** (*Georgia Sta. Rpt. 1931, pp. 29–31*).—In cooperation with the U. S. D. A. Bureau of Animal Industry, three lots of steers were fed for 112 days on a basal ration of cottonseed meal, cottonseed hulls, and a mineral mixture. Lot 1 received a full feed of shelled yellow corn, while in lot 2 25 per cent of the corn was replaced with blackstrap feeding molasses and in lot 3 50 per cent of molasses replaced a like amount of corn. The average daily gains in the respective lots were 2.4, 2.3, and 2 lbs. per head. Substituting molasses for half of the corn was not satisfactory, but the molasses was used to better advantage when only 25 per cent was included in the ration. More profitable gains were made during the first 84 days of the test than during the entire period. The returns per bushel of corn fed were 95, 86, and 61 cts. in the respective lots.

**Productive energy of feeds calculated from feeding experiments with sheep, G. S. Fraps** (*Texas Sta. Bul. 436 (1931), pp. 56*).—The productive energy of a number of feeding stuffs was calculated from 81 feeding experiments, including 336 lots of sheep, conducted at various experiment stations. The productive energy was measured by the gain in flesh and fat when the feed was added to a ration a little more than sufficient for maintenance.

On the average a pound of gain in weight by fattening sheep required 2.6 therms of productive energy. The pounds of feed for 100 lbs. of gain were the measure of a ration as a unit and were closely related to the palatability of the feed. The digestible nutrients required for a pound of gain when sheep were fed mixtures made up of various proportions of corn and alfalfa increased as the gain in weight decreased. This was evidence of the lower value of the nutrients of alfalfa compared with corn since the energy in the gain increased as the gain increased. The productive energy required decreased as the gain decreased.

The productive energy of corn fodder and of oat straw was greater in balanced rations than in unbalanced rations, and this value of cottonseed meal and linseed meal was apparently greater when they were used to balance a ration than when used to replace another protein feed. The effect of a protein feed used to balance a ration may be greater than the productive energy of the concentrate itself. Grinding alfalfa to a meal added about 14 per cent to its productive energy.

In some cases the productive energy calculated from the feeding experiments agreed reasonably well with the productive energy calculated from the analyses and production coefficients previously reported. In other cases the productive energy varied from the calculated values, and revised production coefficients are given for these feeds.

**[Studies with sheep at the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 19, 20, 21, 59*).—Several studies are noted.

*Studies of wool growth*, H. Hackedorn and J. Sotola.—Continuing this cooperative study with the U. S. D. A. Bureau of Animal Industry (E. S. R., 64, p. 660), a 65-months-old Rambouillet wether sheared for the first time produced a 76-lb. fleece. This wether had as good a body form as its mate sheared regularly, but was 20 lbs. lighter in weight. The fleece of a 71-months-old wether that had never been sheared showed no signs of slipping.

*Steam-rolled barley for pregnant ewes*, J. Sotola and H. Hackedorn.—A lot of 6 Rambouillet ewes was fed in metabolism crates on the following rations:

(1) Whole barley and alfalfa hay, (2) steam-rolled barley and alfalfa hay, and (3) alfalfa hay alone. The coefficients of digestibility of the nutrients in ration 1 did not materially differ from the coefficients obtained with ration 2. These results showed little benefit derived from steam rolling barley so far as digestibility of the ration was concerned, but calcium and phosphorus balance studies showed a slightly favorable effect from steam rolling on mineral metabolism.

*The nutritive value of range grasses*, R. McCall.—A chemical analysis of blue bunch grass (*Festuca idahoensis*) showed that on the average it contained 12.3 per cent of water, 14.6 per cent of ash, 4.62 per cent of crude protein, 27.18 per cent of crude fiber, 2.65 per cent of fat, and 38.66 per cent of nitrogen-free extract. When young, this grass contained as high as 18.36 per cent of protein on the air-dry basis with a moisture content of 5.31 per cent. Digestion trials with 6 lambs showed this grass to have the following coefficients of digestibility: Dry matter 42 per cent, crude protein 21 per cent, crude fiber 55 per cent, nitrogen-free extract 49 per cent, fat 33 per cent, and ash 2 per cent.

[*Lamb feeding at the Irrigation Branch Substation*], H. P. Singleton.—In this test lambs were fed in 14 groups of 15 head each. Corn, wheat, and barley were found to be superior to oats, and early-maturing native corn was equal to eastern corn for fattening lambs. As supplements to a grain and hay ration, potatoes, corn silage, and cull apples ranked in the order named. The chief value in chopping alfalfa hay was the saving in waste and in labor of feeding.

**[Experiments with swine at the Georgia Station]** (*Georgia Sta. Rpt. 1931, pp. 28, 29*).—The results of two studies are noted.

[*Protein supplements for swine*].—In this test 2 lots of 10 pigs each, averaging 135 lbs. per head, were fed white corn and a protein supplement for 91 days. In lot 1 the pigs received tankage and in lot 2 a mixture containing 50 per cent of cottonseed meal. After 10 weeks of feeding the animals in lot 2 showed evidence of vitamin A deficiency, characterized by staggering gait, unthrifty appearance, and failure to make normal gains. This condition was especially noticeable in the smaller individuals. No such symptoms appeared in lot 1. The slower gaining animals in lot 2 did not show any marked difference in hardness of fat when compared with those in lot 1.

*Effects of heavy irradiation with ultra-violet*.—Evidence accumulated in a test with Chester White pigs indicated that ultra-violet irradiation could be successfully substituted for sunshine. There were also indications that excessive irradiation was harmful. There were no indications that dark skin color gave adequate protection against excessive irradiation.

In checking this work with guinea pigs the evidence was more conclusive of the harmful effect of excessive irradiation. Dermal pigment was observed on white spotted areas which apparently was stimulated by irradiation and which was believed to afford some protection against the irradiation. Animals having the hair clipped from the backbone were especially susceptible to irradiation as evidenced by poor growth and lack of vigor. These animals were apparently shorter lived and succumbed more readily to disease.

**[Swine studies at the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 21, 73, 74*).—The results of two studies are noted.

*Cull peas compared with tankage as protein sources*, C. W. Corbin.—In this test two groups of 12 pigs each, averaging about 91 lbs. per head, were fed. Lot 1 made an average daily gain of 1.9 lbs. per pig and required 348 lbs. of a mixture made up of 84 per cent of wheat, 11 per cent of tankage, and 5 per cent of alfalfa meal per 100 lbs. of gain. Lot 2 made an average daily gain of 1.4 lbs. per pig and required 380.5 lbs. of a mixture of 49 per cent of wheat, 46 per cent of peas, and 5 per cent of alfalfa meal per 100 lbs. of gain. After 40 days, the pigs in lot 2 did not make economical gains and were difficult to keep on feed, and these faults were more pronounced after from 50 to 60 days' feeding.

*Hogging-off of waste peas [at the Pacific Northwest Soil Erosion Substation]*, W. A. Rockie and P. C. McGrew.—Hand-harvesting 44 check plats of field peas after they had been gone over with a combine showed that on the average 473 lbs. of peas per acre remained untouched in the field. A group of 76 head of pigs were marketed after 75 days' grazing on such pea fields with a net gain from waste peas of 61 lbs. per head.

**[Mule feeding tests at the Delta Substation]**, W. E. Ayres (*Mississippi Sta. Rpt. 1931, p. 55*).—Over a 5-year period results indicated that from 1.5 to 2 lbs. of cottonseed meal per mule per day reduced the cost of the grain ration and improved the condition of the animals. Chopping sagrain stover reduced the amount consumed by a 1,250-lb. mule from 11.5 to 9.2 lbs. per day, and mules fed the chopped stover maintained their weight better through 3 feeding periods to the extent of 79 lbs. per mule. Self-feeders for grain with a limited supply of roughage increased grain consumption about 3 lbs. per day, but mules so fed stayed in good condition. Sagrain and soybean pasture were the cheapest feeds for mules from the middle of July until the end of December.

**[Poultry experiments in Mississippi]**, G. R. Sipe (*Mississippi Sta. Rpt. 1931, pp. 48–50*).—These studies have been continued (E. S. R., 64, p. 665).

*Charcoal in the ration for laying hens.*—In this test 4 pens of 15 White Leghorn hens each were fed the same basal ration for 8 months. In addition the respective lots received charcoal at the rate of 1 per cent, 2 per cent, ad libitum, and none. The average production per bird was 86.3, 65.8, 89.2, and 105.8 eggs, and the average mortality was 13.3, 20, 6.7, and 6.7 per cent, respectively.

*Cottonseed meal for laying hens.*—Protein in the form of meat scrap was fed to 4 lots of 15 White Leghorn hens each for 9 months, while 4 similar pens received cottonseed meal. The meat scrap pens consumed 3,106 lbs. of feed and produced an average of 89.1 eggs per bird, while the cottonseed meal pens ate 3,126 lbs. of feed and each bird laid an average of 88.6 eggs. The mortality was the same in both groups. The feed cost for the cottonseed meal groups was $3.61 less than for the meat scrap groups.

*Cottonseed meal for broiler production.*—A test covering a period of 8 weeks was conducted with 4 lots of 250 chicks each. Lot 1 received a standard basal diet, and in the other lots 10 per cent of cottonseed meal replaced a like amount of corn gluten meal, meat scrap, and dried buttermilk, respectively. The initial weight was approximately 20.6 lbs. per pen, while the final weight was 126, 100, 109, and 92 lbs. for the respective pens. Mortality was high in all lots so that the results were not conclusive. Lots 3 and 4 did not eat their feed readily, while lots 1 and 2 consumed all of their feed.

*Cold storage experiment with Mississippi eggs.*—The loss on Mississippi first-class eggs after storage for nearly 6 months was insignificant.

**[Poultry studies at the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 50–52*).—Several studies are noted.

*Breeding and selection*, J. S. Carver and D. Boucher.—In this study, covering the period from 1926 to 1929, inclusive, a significant positive correlation was found between maturity and weight of the first few eggs, and between mean age of maturity and body weight of White Leghorn pullets. No relationship appeared to exist between maturity and mean weight of eggs for the pullet year. Earlier maturing birds laid a larger number of eggs up to March 1. Best production was secured from pullets matured in from 155 to 175 days.

*Watery whites*, J. S. Carver and D. Brazie.—Eggs collected three times daily, dipped immediately in cold mineral oil, and stored under ordinary room conditions at an average temperature of 65° F. were in the same condition after 7 days as when placed in storage. Eggs that remained in the hen house at from 80 to 90° for 5 hours became watery. Individual hens laid eggs that were watery, while other hens under similar conditions laid eggs with normal whites.

*Protein requirements of growing chicks*, J. S. Carver, D. Brazie, and S. A. Moore.—Chicks were fed in 4 lots on rations containing 12.1, 14.8, 17.9, and 22.9 per cent of protein, respectively, furnished in the form of herring fish meal protein. At 8 weeks of age the chicks in the respective lots weighed 378, 528, 608, and 629 gm.

Chicks fed for 12 weeks on a ration with 2 per cent of oyster shell flour and 2 per cent of steamed bone meal added weighed 951 gm. Another lot having 6 per cent of bone meal added to the basal ration weighed 936 gm, or almost twice as much as the check lot receiving no minerals. All the check lot received the same amount of biologically tested cod-liver oil as the other lots, but made poor growth and 100 per cent of the birds had crooked keel bones, while this defect did not appear in any of the other lots.

*Poultry housing*, J. S. Carver.—The results of two years' work showed that it was impossible to provide dry litter in houses under the climatic conditions at Puyallup by the use of an insulated control ventilation house or by the use of an uninsulated roller curtain house. The moisture on the floor was believed to be due to condensation brought about by the difference in temperature of the moisture-laden air in the room and the cooler temperature of the floor.

**Self-selection of feeds by hens**, A. E. Tomhave and C. W. Mumford (*Delaware Sta. Bul. 174* (*1931*), *pp. 24*).—This study was undertaken to determine whether yearling Leghorn hens could select the feeds necessary for maintaining health and production and whether they would vary their choice of feeds according to the rate of production. The birds were divided into two lots of 100 each, and the check pen was fed an all-mash laying ration supplemented with germinated oats, oyster shell, and limestone grit. The other lot had access to 21 feed and mineral ingredients in separate containers during the 168 days of the test.

The birds fed the mixed mash ate from 8 to 78 per cent more feed at various times during the test than did the birds allowed to select their own feed. The lower consumption of the latter lot was reflected in lower egg production, which was a little over half as much as the check group, and in some loss in body weight. Self-fed birds consumed a large proportion of carbonaceous feeds and did not eat enough protein or mineral feeds. An increase in production in the selective-feeding pen did not stimulate consumption of high-protein feeds, but did increase mineral consumption. Mortality was high, molting slow, and average egg weight low in the self-fed lot as compared with the check lot. Eggs from the self-fed lot showed a slightly higher fertility and hatchability than did those from the check lot. Changing the birds to a mixed ration increased egg production and food consumption and decreased mortality.

**Digestibility by chickens of the constituents of the nitrogen-free extract of feeds**, G. S. Fraps (*Texas Sta. Bul. 437* (*1931*), *pp. 15*).—The material used in this study was secured from work previously noted (E. S. R., 58. p. 868). The coefficients of digestibility were obtained in 122 individual tests with 24 feeds, the results of which are given in table form.

It was found that sugars and starches were highly digested by chickens, while pentosans and residual nitrogen-free extract had a low digestibility. The pentosans of roughages or roughage materials were digested to a smaller extent than those of concentrates. On the average chickens digested sugars and starches to the same extent as sheep. The residual nitrogen-free extract was a little less digestible for chickens than for sheep, while the pentosans were only half as digestible for chickens as for sheep.

**The feed required to produce a dozen eggs**, O. S. WILLHAM ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 35 (1932), pp. 3–7*).—Based on figures accumulated in connection with the five egg-laying contests held at the Panhandle Agricultural and Mechanical College, the amount of feed required to produce 1 doz. eggs was calculated by months. The average feed required to produce 1 doz. eggs per year for the 5 years was 2.4 lbs. of grain and 2.1 lbs. of mash.

## DAIRY FARMING—DAIRYING

**[Experiments with dairy cattle at the Mississippi Station]**, J. S. MOORE (*Mississippi Sta. Rpt. 1931, pp. 28, 29*).—Two studies are noted.

*Birth weight of calves.*—Continuing this work (E. S. R., 64, p. 671), the average birth weight of 163 Jersey male calves and 179 female calves was 51.9 and 49.2 lbs., respectively. The average gestation period was 279.9 days for males and 279.3 days for females. The average birth weight of 55 Ayrshire male calves and 52 female calves was 71.9 and 67.3 lbs., respectively. The average gestation period was 281.5 and 280.2 days for the male and female calves, respectively.

*Home grown feeds for dairy cows.*—A system of rotation of crops which will include dairying as an important part of the farming operations is being studied. A 14-acre plat was divided into 6 acres of pasture, 2 acres of meadow, 3 acres of grain, 2 acres of cotton, and 1 acre of silage crops. The crops were arranged so that they would furnish all the feed needed by 4 cows. During the year the plats furnished 5,280 lbs. of hay, 3,480 lbs. of corn, 27,255 lbs. of sorghum silage, and 242 days of pasture. Because of dry weather conditions during the year the cows were fed an additional 2,142 lbs. of hay and 9,598 lbs. of grain. They produced on the average 7,447 lbs. of milk and 345.5 lbs. of fat.

**[Dairy cattle experiments at the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 27–29*).—Several studies were noted.

*The effect of irradiation of the udders of dairy cows on the production of milk, butterfat, and total solids*, J. C. Knott and H. L. Garver.—Irradiating the sides and rear of the udders of two groups of two cows each at a distance of 65 cm for 20 minutes daily during alternate periods of 21 days each had no significant effect upon the quantity of milk produced or upon the butterfat or total solids content of the milk.

*The effect of irradiation of feeds of dairy cows on the production of milk, butterfat, and total solids*, J. C. Knott and H. L. Garver.—Irradiation of the concentrated portion of the ration fed to two groups of two cows each at a distance of 25 cm for 10 minutes daily and feeding these irradiated feeds during alternate 21-day periods had no significant effect on the quantity of milk produced or upon the butterfat and total solids content of the milk. The irradiated feed was a mixture of ground barley, ground oats, wheat bran, linseed meal, bone flour, and salt.

*Dried apple pomace for milk production*, J. C. Knott, R. E. Hodgson, and E. V. Ellington.—Dried apple pomace was compared with dried beet pulp in 3 4-week periods, preceded by a 1-week preliminary period, and fed to 2 lots of 5 cows each. The beet pulp was somewhat less palatable than the apple pomace, but milk production was about 8 per cent higher when beet pulp was fed. There was a slight advantage in weight gains in favor of this feed.

*Raising dairy calves on dried skimmilk*, J. C. Knott, R. E. Hodgson, and E. V. Ellington.—Continuing this study (E. S. R., 64, p. 674), the average daily gain of 16 heifers from birth to 6 months of age was 1.3 lbs. per head. Two of the heifers which did not appear healthy or thrifty until they reached 5 months of age decreased the average for the entire group.

*Efficiency of rotational grazing*, R. E. Hodgson, M. S. Grunder, and J. C. Knott.—In cooperation with the U. S. D. A. Bureau of Dairy Industry, a 4-acre plat was divided into two pastures of equal area, one grazed continuously and the other divided into six equal plats, and the grazing was rotated. There was an advantage of 8.5 per cent in the production of 4 per cent milk in favor of the rotated grazing. The cows grazed in this manner also made 33.9 per cent more gain in live weight in spite of the fact that they received 28.3 per cent less dry matter per cow daily in the form of grass.

**[Experiments with dairy products at the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 25–27*).—The results of two studies, the second of which has been continued (E. S. R., 64, p. 675), are noted.

*The effect of temperature of storage of acidophilus milk upon the number of viable organisms*, C. C. Prouty and H. A. Bendixen.—Numerous strains of *Lactobacillus acidophilus* were grown in pure culture in milk and the resulting product was prepared and frozen into sherbet. Quantitative determinations after 1, 2, 3, 5, and 7 days' storage below zero F. showed a varying resistance of the strains to such treatment. A greater reduction in numbers of organisms occurred in the sherbets with a high acid content. Approximately 30 per cent of the organisms of the more resistant strains remained viable after a 5-day storage period.

*A study of the correlation between cream quality as determined by various tests and butter quality*.—Part 1 of this study, proteolysis in milk and cream, by H. A. Bendixen and C. C. Prouty, showed no correlation between acid production and proteolysis as indicated by ammonia and amino nitrogen accumulation.

In part 2, protein decomposition studies in cream and butter, by Bendixen and R. C. Welch, 12 samples of pasteurized sweet cream and 10 samples of sour cream were churned. The butters were scored after storage for 1, 3, and 6 months. The sour cream and sour cream butter when fresh and after storage ran higher in amino nitrogen than sweet cream or sweet cream butter. The mean increase in amino nitrogen during storage was higher in sweet cream butter than in sour cream butter, but the minimum increase was considerably smaller and the maximum increase considerably greater with the sour cream butter. The average amino nitrogen of cream which made high-scoring butter was lower than that of cream which made low-scoring butter. The total nitrogen content, the total soluble nitrogen content, the percentage of soluble nitrogen of total nitrogen, and the curd content appeared to run lower in sour cream butter than in sweet cream butter. The proteolytic count of the cream and of the fresh butter showed no correlation to the score of either sweet or sour cream butter after 6 months' storage.

In the third phase of the study, methylene blue reduction in cream, by L. A. Black and Bendixen, it was found that acidity seemed to retard reduction and that bacterial activity was evidenced earlier by active reduction than by acid production. The methylene blue test alone was not an accurate index of the age or condition of cream. Lactic acid, proteolytic, and inert-forming and alkali-forming organisms had considerable reducing power, but this power was decreased by high acidity or by low numbers present in the culture or by both.

The last phase, the adaptability of casein agar and bacto nutritive caseinate agar as media for study of proteolytic organisms in dairy products, by Bendixen and Welch, showed that caseinate agar gave higher bacterial counts than extract agar with all dairy products except storage butter. Casein agar gave higher proteolytic counts on milk and storage butter than caesinate agar. Organisms which were proteolytic on casein and caseinate agar showed increases in formol titration values, but not all of them increased the Foreman titration values nor the soluble nitrogen content of milk. Alkali-forming proteolytic organisms generally caused a larger increase in soluble and amino nitrogen than acid-forming proteolytic types. Litmus milk tubes were usually a poor index of the proteolytic or caseolytic power of bacteria from dairy products.

**The effect of some southern roughages when fed with basic grain mixtures on the fat constants, flavor, texture, and standing-up properties of southern butter,** J. S. Moore (*Mississippi Sta. Rpt. 1931, pp. 22–27*).—Continuing this study (E. S. R., 64, p. 675), it was found that alfalfa hay, lespedeza hay, good quality soybean hay, Johnson grass, and Bermuda grass produced butter of equal quality and had no marked effect on texture. Sorghum and corn silages produced butter of equal quality. Differences in the scores of a single sample of butter by the several judges varied more than any effects of feeds.

The cream from Jersey cows churned out quicker and cleaner than that from Ayrshire cows, and the butter of the former was firmer and easier to handle during warm weather than that of the latter. The refractive index curve followed the iodine curve closely, and the melting point was independent of other fat constants. The Jersey butter was more resistant to pressure than was indicated by the melting point.

Cottonseed meal and the Jersey breed were found to be the most important factors in bringing about noticeable firmness in butter. Wide changes in fat constants may be due to readjustments of the cow to new feed or to not consuming enough of the new feed. Some cows showed more variation in fat constants than did others.

**Cream-standardization tables,** O. E. Williams (*U. S. Dept. Agr. Circ. 199 (1932), pp. 14*).—In this publication the various calculations for standardizing cream with skim milk and with whole milk varying in fat content from 3.4 to 4.8 per cent are presented in tabular form.

**Dry skimmilk in ice cream,** C. D. Dahle, C. C. Walts, and J. I. Keith (*Pennsylvania Sta. Bul. 271 (1931), pp. 27*).—Continuing this study (E. S. R., 66, p. 269), it was concluded that dry skim milk of "extra" grade could be used satisfactorily for supplying the serum solids needed in addition to those supplied by milk and cream. When spray process or vacuum roller process powders were used as much as 10 per cent of the total serum solids of a mix (11.7 per cent serum solids) could be supplied by the dry skim milk. However, only 8 per cent of the serum solids could be supplied by atmospheric roller process powder without seriously affecting the flavor. These amounts applied when fresh cream and milk were used to supply the butterfat and remainder of the serum solids of the mix. Spray and vacuum process powders were superior from the standpoint of overrun, freezing time, and quality to atmospheric roller powder for ice cream.

## VETERINARY MEDICINE

**[Report of the division of veterinary science]**, J. W. KALKUS and C. E. SAWYER (*Washington Col. Sta. Bul. 260 (1931), pp. 52, 53*).—Reporting upon abortion work with cattle, it is stated that at the Western Washington Station the project commenced in 1923 was discontinued at the close of June, 1931, the only four infected cows remaining in the herd having been disposed of and the herd placed on an abortion-free basis. The work has shown that it is possible to control and eradicate the disease in a dairy herd by consistent blood testing, the proper segregation of reacting and nonreacting animals, and the enforcement of proper sanitary measures.

The work with red water in cattle failed to substantiate the view that this disease is produced by the oxalic acid in plants grown on acid soils, as expressed by Hadwen in British Columbia in 1917 (E. S. R., 38, p. 486).

**[Forage poisoning due to Claviceps paspali on Paspalum grass]**, M. GIEGER (*Mississippi Sta. Rpt. 1931, p. 21*).—The author reports having separated the amorphous alkaloid from the oil of *C. paspali* for the first time. This alkaloid was found to be very toxic, less than 0.1 gm proving fatal to the guinea pig.

**Hexylresorcinol in the treatment of human ascariasis**, P. D. LAMSON, E. L. CALDWELL, H. W. BROWN, and C. B. WARD (*Amer. Jour. Hyg., 13 (1931), No. 2, pp. 568–575*).—The authors have found that hexylresorcinol, given in crystalline form in hard gelatin capsules in doses of 1 gm to adults and 0.5 gm to children on an empty stomach in the morning and followed by a purge of magnesium sulfate in 24 hours, removed between 95 and 100 per cent of the worms in the cases of human ascariasis treated. No symptoms of any importance followed these administrations. A dose of 0.5 gm removed 76 per cent of the worms from adults. The ascaricidal properties of hexylresorcinol are greatly reduced when this substance is given in a solvent such as vegetable oils or glycerin, or when food is taken just before or after treatment.

**Methods for the isolation of Brucella abortus**, B. S. HENRY, J. TRAUM, and C. M. HARING (*Hilgardia [California Sta.], 6 (1932), No. 12, pp. 355–379, figs. 7*).—In this contribution the authors report upon the procedures followed, together with some experimental data, based upon several years' work by the station and other laboratories interested in bovine abortion control. In a comparison made of direct-culture methods with guinea pig inoculations for the isolation of *B. abortus* from milk, inoculations proved much more efficient. The technic to be employed in the isolation of *B. abortus* by guinea pig inoculation and by culture methods is described in detail.

An attempt was made to determine the reliability of the three common criteria of infection in artificially inoculated guinea pigs, namely, agglutinin production, lesions, and spleen cultures. The relation of positive spleen cultures, agglutination titers over 1 to 25, and macroscopic lesions, in a total of 516 guinea pigs showing some evidence of infection, was 98.8 per cent, 93.8, and 84.7 per cent, respectively. For this reason the spleen-culture indication is considered the most reliable of the three. The incidence of *B. abortus* in the urine and blood of guinea pigs 6 weeks after inoculation with infected material was observed. This organism was recovered in cultures of the urine in 22.6 per cent of 106 guinea pigs known to be infected, and the frequency of the organism in the urine of males was over three times that in the urine of females. *B. abortus* was also obtained in cultures from the blood in 47.6 per cent of 126 guinea pigs known to be infected. There was no significant difference between the number of positive blood cultures obtained from the male and the female guinea pigs.

A list is given of 21 references to the literature.

**The relation between specific and non-specific agglutination in the Brucella group**, S. R. PANDIT and G. S. WILSON (*Jour. Hyg. [London], 32 (1932), No. 1, pp. 45–54*).—The authors report upon 117 strains of Brucella, belonging to different types and isolated from different parts of the world, that were examined by the thermoagglutination, salt agglutination, acid agglutination, and specific serum agglutination tests.

The results obtained by the thermoagglutination and the serum agglutination tests were in close agreement; there was a high degree of correlation between these tests and the acid agglutination test, and a rather lower correlation with the salt agglutination test. "Generally speaking, a strain which is highly thermoagglutinable is frequently agglutinated by salt, is usually agglutinated strongly by acid, and reacts to a paramelitensis, but not to an abortus serum. A strain which is moderately thermoagglutinable is seldom agglutinated by salt, is frequently agglutinated by acid, and reacts either with an abortus or a paramelitensis serum, or with both sera. A strain which is not thermoagglutinable is not agglutinated by salt, seldom reacts markedly to acid agglutination, and is generally agglutinated by an abortus but not by a paramelitensis serum. There remain, however, a certain number of strains, particularly of the porcine and bovine abortus types which, though nonthermoagglutinable, inagglutinable by salt, and reacting only with an abortus serum, yet show some degree of acid agglutination. Of the 12 porcine strains examined only 1 strain was strongly thermoagglutinable; of the 47 bovine strains only 2 were strongly thermoagglutinable, a further 2 showing a milder degree of thermoagglutinability; of the 47 melitensis strains 8 were strongly and 13 were moderately thermoagglutinable; while of the 11 paramelitensis strains 10 were strongly thermoagglutinable."

**Isolation and cultivation of Mycobacterium paratuberculosis**, D. J. HEALY and W. W. DIMOCK (*Ky. Acad. Sci. Trans., 3 (1927–1928), p. 30*).—This abstract of a contribution from the Kentucky Experiment Station mentions the early successful attempts at cultivation and the authors' successful cultivation, the second successful attempt in America and the sixth time that the microbe was ever cultivated, and locates the microbe in its proper order, family, and genus. The original paper, read on May 7, 1927, is said to have described its cultural requirements and characteristics, also its morphology and the difficulties encountered in its continued cultivation.

**The use of formalised virulent rinderpest blood as a vaccine**, W. G. BEATON (*Vet. Jour., 87 (1931), No. 677, pp. 530–532*).—It was found in work in Nigeria that virulent rinderpest blood in contact with 3 per 1,000 formalin or 3 per 1,000 formalin plus 10 per cent of tapioca, when inoculated in one dose of 10 cc or two doses of 10 cc at 4 weeks' interval, did not protect susceptible cattle tested 3, 4, and 5 weeks later with virulent blood. These results are said to confirm the findings of Daubney (E. S. R., 60, p. 370) and Kelser (E. S. R., 60, p. 270).

**Infectivity of shade-dried hides from rinderpest infected cattle**, W. G. BEATON (*Vet. Jour., 87 (1931), No. 677, pp. 532, 533*).—The author found in work in Northern Nigeria that the period of infectivity of shade-dried hides from rinderpest-infected cattle reached at least 36 hours but not 48 hours.

**The relationship of pica in cattle to trypanosomiasis**, W. HENDERSON (*Vet. Jour., 87 (1931), No. 677, pp. 518–529*).—The author concludes that pica in Northern Nigeria bears a close relationship to trypanosomiasis of cattle.

The infection by trypanosomes causes an acidosis in the animal, with consequent upset of the alkali reserve of the blood. The excessive excretion of sodium and calcium during an acidosis can not be compensated by the amount of these elements in the herbage normally grazed by the cattle. The uncompensated loss of sodium and calcium leads to a craving for salts containing these elements, and it is expressed by the showing of pica symptoms and signs.

**Arthritis in lambs (stiff lambs)** (*Montana Sta. Bul. 253 (1931), pp. 8, figs. 6*).—A brief practical account of chronic arthritis as a cause of stiff lambs on summer range.

**Foot-rot in sheep** (*Montana Sta. Bul. 254 (1931), pp. 11. figs. 8*).—A brief practical account of an infectious disease caused by *Actinomyces necrophorus*.

**Prevention of disease in young lambs** (*Montana Sta. Circ. 138 (1931), pp. 14, figs. 7*).—A practical summary of information dealing with shed sanitation, care of the pregnant ewe, necrobacillosis of the liver, joint disease, paralysis, dirt eating and wool eating, lamb dysentery, lamb pneumonia, sore eyes, stiff lambs, and blackleg.

**Control of gastrointestinal parasites of sheep by weekly treatments with various anthelmintics,** W. H. WRIGHT and J. BOZICEVICH (*Jour. Agr. Research* [*U. S.*]. *43 (1931), No. 12. pp. 1053–1069, figs. 2*).—Comparative experiments with copper sulfate, carbon tetrachloride, and tetrachlorethylene in the treatment of sheep for the common stomach worm (*Haemonchus contortus*) and other worms, conducted at Bethesda, Md., are reported upon.

" Weekly treatments for a little more than a year with 100 cc of a 1 per cent copper sulfate solution, 5 cc of carbon tetrachloride, or 5 cc of tetrachlorethylene failed to remove all parasites present in sheep kept in small inclosures. Tetrachlorethylene gave the best results and produced no bad effects. Although total elimination of parasites was not possible, repeated anthelmintic treatment resulted in greatly reducing the worm burden of the sheep and maintaining it at a low level during the experiment. Two sheep receiving carbon tetrachloride died in 33 and 34 weeks, respectively, after the experiment was begun, apparently from the effects of repeated administration of the drug. It is therefore apparent that sheep can not be safely treated once every week with carbon tetrachloride. The weekly administration of tetrachlorethylene or 1 per cent copper sulfate solution caused no harm to the sheep in this experiment.

" Pathological changes in the livers and kidneys of the treated sheep could not be attributed to the action of the various anthelmintics. Chemical analyses of sheep livers indicate that there is a considerable storage of copper in the organ following the administration of copper sulfate solution. This storage apparently was not responsible for the production of toxic symptoms, and copper sulfate was found not to act as a cumulative poison. The repeated anthelmintic treatment with each of the drugs did not cause abortion in pregnant ewes. Lambs born of ewes in the experiment maintained a consistently low level of parasitic infestation, though untreated and kept on the same ground with the ewes."

These results indicate that the attack against parasites of sheep must be directed along lines in which the factor of degree of stocking on pastures is definitely taken into consideration and correlated with the factor of medicinal control. Combining the use of larger areas with weekly treatments with drugs which, in this paper, have been shown to be safe for sheep may result in eradication of the parasites.

**Parasites of sheep and swine,** M. C. Hall (*Vet. Alumni Quart.* [*Ohio State Univ.*], *19* (*1931*), *No. 3, pp. 120–131*).—This is a practical summary of information on the parasites of sheep and swine.

**Relation of Balantidium coli infection to the diet and intestinal flora of the domestic pig,** E. Schumaker (*Amer. Jour. Hyg.*, *13* (*1931*), *No. 2, pp. 576–584*).—"In determinations made upon cecal material from 79 pigs it has been found that heavy infections with *B. coli* in the domestic pig were accompanied generally by an intestinal flora which contained greater numbers of aciduric organisms and lesser numbers of lactose fermenters and proteolytic anaerobes. The converse was also true; light infections with this protozoan were, in general, accompanied by a lesser number of aciduric organisms and a greater number of lactose fermenters and proteolytic anaerobes. Although it has been found that high infections with Balantidium were accompanied by a very slightly more acid reaction of the cecal content, it is doubtful that this finding has any significance. Large amounts of starch, both microscopic and macroscopic, were found in the cecum of pigs which had heavy infections with *B. coli*. Heavy infections of Balantidium in the pig were accompanied by a diet high in carbohydrate in the form of grain. This was manifested by the nature of the intestinal flora and by the presence of undigested carbohydrate in the immediate environment of the parasite."

**The swine fever outbreak of 1927–1928 in New South Wales,** M. Henry, H. R. Seddon, and C. Blumer (*Sydney: N. S. Wales Dept. Agr.*, *1931*, *pp. 138, pls. 4*).—Details of the outbreak of hog cholera in 1927 and 1928 in New South Wales are given in this mimeographed report.

**Some observations on experimental ascariasis in pigs,** D. O. Morgan (*Jour. Helminthol.*, *9* (*1931*), *No. 3, pp. 121–128, fig. 1*).—Five miscellaneous experiments on ascariasis in pigs are briefly reported.

**The kidney-worm of swine, Stephanurus dentatus,** B. G. P[eters] (*Jour. Helminthol.*, *9* (*1931*), *No. 3, pp. 179–190; also Imp. Bur. Agr. Parasitol.* [*St. Albans*], *Notes and Memo. No. 3* (*1931*), *pp. 12*).—This is a summary of information presented in connection with a bibliography of six pages.

**Hereditary transmission of Piroplasma bigeminum in Rhipicephalus bursa: Persistence of the parasite in ticks nourished on horses** [trans. title], E. Sergent, A. Donatien, L. Parrot, and F. Lestoquard (*Bul. Soc. Path. Exot.*, *24* (*1931*), *No. 3, pp. 195–198*).—In experimental work in Algeria with the two-host tick *R. bursa*, the authors find that *P. bigeminum*, which causes bovine piroplasmosis, is transmitted through the egg, larval, and nymphal stages to the adult even when the first host, on which the larval and nymphal stages are passed, is an unsusceptible animal such as the horse. However, the disease resulting from an infection transmitted after engorgement of the tick on an unsusceptible host is usually benign (E. S. R., 65, p. 776).

**Studies on coccidiosis.—I, The effects of coccidiosis upon the weights of chickens artificially inoculated during the seventh week,** R. L. Mayhew (*Poultry Sci.*, *11* (*1932*), *No. 1, pp. 34–39, figs. 3*).—In studies at the Louisiana Experiment Stations it was found that the average weights of a severely infected lot of chickens are definitely affected by an epidemic of coccidiosis. Although the symptoms of the disease appear on the fifth and sixth days, the maximum difference in weight is not attained until about the tenth day after inoculation. These results seem to indicate that a single severe infection retards the growth of chickens for at least 12 weeks as compared with uninfected.

**The distribution of coccidial oöcysts on a poultry farm in Maryland,** J. Andrews and H. Tsuchiya (*Poultry Sci.*, *10* (*1931*), *No. 6, pp. 320–326*).—

The authors found counts made of oocysts of various samples obtained on a poultry farm at Chestertown, Md., to indicate that the oocysts are most numerous under perches, brooding canopies, in and around drinking fountains, and around food hoppers. As a control measure it is suggested that the birds be prevented from access to these sources of infection by the installation of suitable platforms of wire mesh to cover these heavily infected situations.

**The constancy of repeated agglutination tests in the diagnosis of pullorum disease,** J. Biely (*Canad. Jour. Research, 5 (1931), No. 6, pp. 693–706, pl. 1*).—In the study conducted, a high degree of consistency was secured in retests of five groups of birds from various sources when tested from 2 to 22 times. "The results of repeated agglutination tests were, except in a few cases, confirmed by the macroscopic appearance of the ovary and by bacteriological examination. Data show that positive reactors consistently react positive to the test, and that they seldom recover from pullorum infection. This is especially true of birds that have completed the first laying year. With these very little variation can be expected in retests at short intervals. In the case of pullets that are just starting to lay, a small percentage of reactors may throw off the infection and subsequently react negatively.

"Nonreactors from an infected flock when left in contact with reactors in presence or absence of males may in later tests react positively. This is generally due to infection through contact with infected birds, contaminated droppings, feed, water, or litter. These nonreactors, if kept isolated from reactors, as a rule remain negative. When such birds become reactors at subsequent tests, the possibility of recent infection taking place just before or after the first test is not excluded. Hence, nonreactors from infected flocks should be retested at short intervals.

"Suspicious reactors as a rule do not show marked variations in titer from month to month. It is impossible to predict whether a suspicious reactor will in course of time become a distinctly positive or negative reactor. With these birds, therefore, diagnosis must be done with care and the general condition of the flock taken into consideration. In an eradication program the bird has to be sacrificed unless it is very valuable, in which case several retests would need to be conducted before a final diagnosis is made.

"Male birds do not as a rule react in as high dilutions as females, consequently fluctuations in reaction from test to test are not uncommon. Therefore, particular care must be exercised in diagnosis in the case of male birds."

**A comparative study of the tube, rapid serum, and rapid blood drop agglutination tests for the detection of white diarrhea,** G. R. Sipe (*Mississippi Sta. Rpt. 1931, p. 51*).—In a comparative test made with 1,250 birds to determine the practicability and efficiency of the three tests for pullorum disease, 265 fowls reacted positively to the rapid blood drop test, 285 to the rapid serum test, and 268 to the tube test.

**Etiological studies of blackhead (entero-hepatitis) in turkeys,** J. P. Delaplane (*Rhode Island Sta. Bul. 233 (1932), pp. 15, fig. 1*).—In the transmission experiments here reported it was ascertained that blackhead can be produced in young turkeys by the rectal injection of fresh, finely ground blackhead liver. Birds free from intestinal protozoa and given such material were found to harbor the flagellate organism *Histomonas meleagridis*. The ground diseased ceca of turkeys or chickens harboring no other protozoa than *H. meleagridis* were capable of infecting turkey poults when the material was injected rectally into them. Both ceca of birds artificially infected showed lesions of the disease in contrast to only one as is usually seen in naturally infected birds. Young chicks when infected with *H. meleagridis* showed lesions in their ceca similar to those seen in the ceca of turkeys suffering from the disease, and in some cases the birds developed liver lesions of the disease.

**On the occurrence of gapeworms in nestling starlings and adult fowls,** D. O. Morgan (*Jour. Helminthol., 9 (1931), No. 3, pp. 117–120*).—A brief account of observations presented in connection with references to the literature.

**Hand-list of helminth parasites of the rabbit** (*Jour. Helminthol., 9 (1931), No. 2, pp. 105–116; also Imp. Bur. Agr. Parasitol. [St. Albans], Notes and Memo. No. 2 (1931), pp. 12*).—This is a compilation of the helminth parasites recorded from the common rabbit (*Oryctolagus cuniculus = Lepus cuniculus*), grouped under the four main classes, Trematoda, Cestoda, Nematoda, and Acanthocephala, and alphabetically arranged within each class. The list is presented in connection with a bibliography of four pages.

**Observations on the immunity response in experimental ascariasis in rabbits,** W. K. Blackie (*Jour. Helminthol., 9 (1931), No. 2, pp. 91–96, fig. 1*).—A preliminary account is given of certain serological investigations conducted with a rabbit fed on the embryonated eggs of *Ascaris megalocephala*. Application of the complement fixation test has shown that a definite immunity response occurs in the first five weeks of the infection.

**Myiasis in jack rabbits, Lepus californicus texianus,** R. A. Roberts (*Jour. Parasitol., 18 (1931), No. 2, pp. 102–104*).—This is an account of observations of myiasis in the hare *L. californicus texianus* Waterh., commonly known as the Texas jack rabbit, caused by several species of blowflies (the screw worm, *Sarcophaga sulcata* Ald., and *S. plinthopyga* Wd.), which followed infestation by the rabbit bot *Cuterebra* sp.

**The helminth parasites of common rats,** J. N. Oldham (*Jour. Helminthol., 9 (1931), No. 2, pp. 49–90*).—This systematic consideration of the helminth parasites of common rats, giving the rat hosts, location, locality, and references for each of the parasites, is followed by a list of the 109 helminths implicated, of which 27 are trematodes, 41 cestodes, 40 nematodes, and 1 an acanthocephalid. A seven-page list of references to the literature is included.

**Salmon poisoning,** B. T. Simms, C. R. Donham, and J. N. Shaw (*Amer. Jour. Hyg., 13 (1931), No. 2, pp. 363–391*).—This contribution from the Oregon Experiment Station is a summary of the knowledge of salmon poisoning in Canidae, which is a disease associated with infestation with the trigenetic intestinal fluke *Nanophyetus salmincola* Chapn. The authors have found no evidence that this parasite is lethal to *Goniobasis plicifera silicula* (Gould), its snail host. It is pointed out that fish hosts tolerate very severe infestations, and that of the mammalian hosts Canidae only have developed the disease. The disease, the specific cause of which is unknown, has a definite incubation period followed by typical acute symptoms and high mortality. Significant pathological lesions are limited to the digestive tube. Those that recover are possessed of a definite immunity, although attempts to produce immunity have been unsuccessful. No satisfactory remedial treatment has thus far been found. See also a previous note (E. S. R., 65, p. 72).

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations at the Washington Station]** (*Washington Col. Sta. Bul. 260 (1931), pp. 10, 11, 55–57, 70–73*).—Experiments by H. L. Garver and J. Knott on the irradiation of cows' udders and flanks and of feeds with ultra-violet light showed no increase in milk flow or in butterfat from the use of either the carbon arc or quartz mercury lamp.

Experiments by Garver on orchard irrigation by overhead sprinklers showed that the costs of this system are generally higher than where the furrow system of irrigation is used, but that the sprinkling system appears to be of value for steep slopes or coarse soils.

Tillage and soil moisture studies, conducted by H. M. Wanser and H. D. Jacquot at the Adams Substation, showed that the water from a rapidly melting heavy snow blanket is more rapidly absorbed by a cultivated surface and that the moisture from winter conditions which produce a light run-off is absorbed better by uncultivated surfaces.

Experiments on terracing and on the operation of machinery on terraced land, conducted by P. C. McGrew at the Pacific Northwest Soil Erosion and Moisture Conservation Experiment Station in cooperation with the U. S. D. A. Bureau of Agricultural Engineering, showed that considerable difficulty was experienced in operating machinery over terraced land. This was particularly true of the peg-tooth harrow with rigid drawbar, and it was necessary to install a hinged drawbar. It was found that the chisel type implement, duck foot, and tandem disk can be used to advantage on terraced land.

**Evaporation from free water surfaces,** C. Rohwer (*U. S. Dept. Agr., Tech. Bul. 271 (1931), pp. 96, pls. 10, figs. 15*).—The studies on which this report is based were conducted in cooperation with the Colorado Experiment Station. They deal with the factors causing evaporation, the derivation of the general laws under which these factors operate, and the valuation of the relation between evaporation as it takes place from various types of standard evaporation tanks and as it is found to occur from a large water surface.

The calibrations of the optical evaporimeter used in measuring evaporation under still air and under controlled conditions in the laboratory and under fully exposed conditions outside showed that in general the average maximum deviation from the mean values of the constants was between 4 and 5 per cent. A comparison of vapor pressures determined by the sling and by aspiration psychrometers indicated that the sling psychrometer gave consistently lower results, the mean difference being 4.08 per cent. However, both of these psychrometers gave higher values than those determined by the Alluard dew-point hygrometer.

For still-air conditions in the laboratory there was no relation between the evaporation and the temperatures of air and water, but there was a definite relation between the difference in temperature and the evaporation and between the difference in vapor pressure and the evaporation. Expansion and contraction due to temperature changes were found to have a definite effect on evaporation observations, but may be eliminated.

Tests on the effect on evaporation of expansion and contraction due to temperature changes showed that the evaporation from the oil film used to cover the water surface was about 2 per cent of the evaporation occurring from a water surface under similar conditions.

Under conditions of controlled wind in the laboratory, evaporation bore no relation to the temperature of the air or of the water, or to the difference in temperature of the air and the water. However, a definite relation was found to exist between evaporation and wind velocity and between evaporation and difference in vapor pressure. A definite increase in evaporation was observed with increase in altitude.

A summary of data relating to the accuracy of methods of evaporation measurement also is included. A list of 34 references to the investigations of others bearing on the subject is appended.

**Results of experiments on earth pressures** [trans. title], L. Ravier (*Compt. Rend. Acad. Sci.* [*Paris*], *190 (1930), No. 8, pp. 470–472; abs. in* [*Gt. Brit.*] *Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 4, p. 139*).—The results of tests on small scale retaining walls supporting noncohesive gravel filling showed that the tension in anchor rods due to superloads increases less rapidly than the load and remains practically undiminished when the superload is removed. This is attributed to the fact that the gravel, once compacted by the weight of the superload, does not on removal of the latter regain its former looseness.

The author concludes that if the filling can be compressed without subjecting the wall to increased pressure any addition of superload will result in reduced or negative pressure on the wall. Many gravels are composed of flat particles, which, when disturbed, have a tendency to settle with their flat sides horizontal. Trenches may be cut to a considerable depth in soils which have been compacted under natural conditions, and to a certain point loads may be supported near the edges without causing them to fall in. Such considerations detract from the value of theories of earth pressures based on the assumption that the soil is an isotropic medium.

Coulomb's theory is considered the best, as it is most easily adapted to actual conditions.

**The plasticity of clay, I, II** (*Ceram. Soc. Trans., 29 (1930), No. 5, pp. 177–207, figs. 15; 208–216, figs. 3; abs. in [Gt. Brit.] Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 5, pp. 156, 157*).—This report consists of two parts.

I. *Mechanical methods of measurement*, S. R. Hind—In this part of the report a critical survey of the literature on the mechanical testing of plastic clays is given. Mellor's data on the effect of pressure on stickiness were found to agree with the expression $A=2.78+0.00437\ P^{32}$, where $A$ is the ratio of weight of clay to weight of water and $P$ is applied pressure in kilograms per square centimeter. This may be interpreted to mean that the pressure required is dependent on the relative amount of water in the clay surface.

Tests on the axial compression of rectangular plastic clay blocks showed that resistance to deformation increased progressively with deformation in a manner which could not be accounted for by increased cross section. The retraction consequent on reducing the load was demonstrated and shown to be practically uninfluenced by the previous deformation suffered by the clay. The plastic deformation of clay, whether under axial compression or tension, was considered to resolve itself principally into shear or slipping of the clay in layers.

Experiments on the intermittent loading of test pieces in tension were shown to bear out the main conclusions to be derived from previous tests. A suitable technic for this class of test is described and results given for different classes of clays, plasticene, and ball-clay rape-oil mixture.

Extensive experiments were conducted on the extensibility of a standard clay, on which much collateral data is available, under conditions of automatically increasing load. By molding the test piece directly in end pieces, providing it with a prearranged neck at which plastic distortion took place, providing means whereby the molded test piece was transferred to the testing position without contact with the hands or relative movement of the end pieces, and by carrying out the experiments in a saturated atmosphere at 20° C., it proved to be possible to obtain close agreement between tests. The stress strain diagrams, up to a point at which incipient fracture was deemed to interfere, were susceptible to simple mathematical expression. Thus $L\times\frac{B'}{C}=\sqrt{E}$ was found to be in general agreement with the data, $L$ being the load, $E$ the amount of extension, and $\frac{B'}{C}$ a softness factor, in which $B'$ was peculiar to the clay and the shape, etc., of the specimen, while $C$ was the rate of loading.

The softness factor was determined for the given clay with all workable moisture contents, and a further simple relation found to apply to the whole range of stress strain diagrams, viz: $(M-M_o)^2=P.\frac{\sqrt{E}}{L}$ where $M$ is the moisture content of any specimen, $E$ its extension under the load $L$. The constant $M_o$ gives the lower limit of plasticity for hand working, and $P$ represents the way in which softness increases with increase in moisture content.

No indication was obtained that any combination of factors which might be termed "plasticity" attained a maximum at the state known as the best working consistency. It was shown that the ultimate tensile strength and extensibility were simply related to the softness factors, and that these were in consequence related to all the plastic behavior of the clay within the limits of the experimental procedure. Methods by which the survey of the plastic properties of clay might be carried to a logical conclusion were suggested. A bibliography of 23 references is appended.

II. *The effect of non-plastic additions on the mechanical properties of a plastic clay*, S. R. Hind and E. P. Degg.—Experiments based on a method and apparatus designed by one of the authors are described. The characteristics of the stress strain diagrams, up to incipient rupture, for mixtures of a standard clay with 20 to 40 per cent grog in 10 per cent proportions up to 60 per cent were investigated. The data confirm previous findings as to the nature of the diagrams. Further data were obtained to show the effect, in 30 per cent concentration, of nonplastics ranging in particle size from approximately 0.016 to 1.42 mm.

The data suggest that plasticity numbers derived by Atterberg's or similar methods give results which are affected to an important extent by the arbitrarily chosen limits, and that such numbers probably confuse the workability with the minimum moisture content at which plasticity is developed. It was shown that both the workability, $P$, and the minimum moisture content, $M_o$, for the development of plastic properties, decrease regularly with increasing grog content, and that the workability with the finest nonplastic additions tends to decrease in direct proportion to the clay content.

On the other hand, the workability is decreased at a considerably greater rate with coarser nonplastic (ordinary grog sizes). The decrease in minimum moisture content for workability is approximately proportional to the clay content for mixtures up to 40 per cent grog, after which it decreases more slowly. A comparison of this curve with the corresponding points at which shrinkage ceases in drying shows that in this case plasticity ceases at a higher moisture content than does shrinkage, and, consequently, a danger zone for drying exists. The two curves, however, approach one another and are coincident at 60 per cent grog, which is also the point of maximum dry density for these clay grog mixtures.

**The comparative strength of short wooden beams with and without overhang beyond the supports**, F. J. Converse (*Amer. Soc. Testing Materials Proc., 30 (1930), pt. 2, pp. 1006–1011, figs. 4*).—In an investigation carried out at the California Institute of Technology to determine whether the resistance of a wood beam to longitudinal shear is influenced by the length of overhang of the beam beyond the supports, test specimens of various lengths, with sections ranging from 1.62 to 2.25 in. wide and 1.80 to 3.53 in. deep, were tested by loads applied near to the centers of spans ranging from 9 to 16 in., some with negligible overhangs and others with overhangs ranging from 5 to 7 in. The woods tested were Douglas fir, spruce, redwood, and oak.

It was found that in all cases where load is applied parallel to the grain of the wood and is so distributed as to prevent crushing of the fibers under the load and at the supports, overhang has but little effect upon strength in shear. Where much crushing occurs at supports and beneath the load, the breaking load is in general higher for beams with overhang than for those without. The elastic line of short beams with overhanging ends reverses its direction of curvature near the inside edge of the supports, and becomes concave downwards for a short distance before becoming a straight line in the overhanging portions of the beam.

**Tests of welds,** W. M. Wilson (*Ill. Univ., Engin. Expt. Sta. Circ. 21 (1930), pp. 37, figs. 22*).—The results of tests of electric arc and hand welds of thin steel plates used in the fabrication of tanks for storage of oil and water are reported.

Of the welds tested, the V type seems to be the best for making butt joints in 0.5-in. plates. Six specimens were made from each of 11 kinds of uncoated weld rods. The lowest average strength for any one set of 6 specimens was 50,531 and the average for the 66 specimens 54,410 lbs. per square inch.

Specimens made from three rods designed to produce a reducing atmosphere over the molten metal had ultimate strengths of 76,621, 67,979, and 52,102 lbs. per square inch, respectively. The strength of the all-weld specimens made of uncoated rods was 57,500 lbs. when the beads were laid longitudinally with the specimens, and 43,314 lbs. when the beads were laid transversely to the specimens. The corresponding values for covered rods were 57,300 and 52,375 lbs. per square inch, respectively.

Results are also given for elongation in 8 in. and for the modulus of elasticity in pounds per square inch. Six specimens containing lap joints welded with uncovered rods all broke outside the weld, the average strength being 57,605 lbs. per square inch, a value just slightly greater than the strength of the control specimens cut from the plates.

**Public Roads, [January, 1932]** (*U. S. Dept. Agr., Public Roads, 12 (1932), No. 11, pp. 269–292+[2], figs. 24*).—This number of this periodical contains the current status of Federal-aid road construction as of December 31, 1931, and the following articles: Effect of Size of Batch and Length of Mixing Period on Rate of Production and Quality of Concrete Mixed in Standard 27E Pavers, by T. C. Thee (pp. 269–289, 292); and Relation Between the Strength of Cement and the Strength of Concrete, by F. H. Jackson (pp. 290, 291, 292).

**The high-speed internal-combustion engine,** H. R. Ricardo (*London: Blackie & Son, 1931, pp. [7]+435, figs. 292*).—This is a revised and enlarged edition of the second volume of a book published in 1923 and entitled The Internal-Combustion Engine. It contains chapters on volatile liquid fuel for internal-combustion engines, detonation, distribution of heat in a high-speed four-cycle engine, influence of form of combustion chamber, lubrication and bearing wear, mechanical design, mechanical details, valves and valve gear, piston design, engines for road vehicles, aero-engines, high-speed heavy-duty engines for tanks, and high-speed Diesel engines.

**Effect of use on the properties of motor oils,** S. L. Smith and E. Glaister (*Engineer [London], 151 (1931), No. 3929, pp. 476–478, figs. 10*).—Experiments with the Deeley oil-testing machine are reported which were conducted at the City and Guilds College, South Kensington, England. Both the static and kinetic coefficients of friction were measured and utilized to find the changes brought about in the lubricating properties of certain motor oils when used in internal-combustion engines.

The most significant result from the experiments showed that there is a large decrease in the kinetic coefficient of motor oils during use, due entirely to the reduction in viscosity brought about by fuel dilution. The results also showed conclusively that the Deeley machine can be used successfully to measure the kinetic coefficient of a lubricant when in the truly fluid or the semifluid state.

**Nebraska tractor tests, 1920–1931,** C. L. ZINK ET AL. (*Nebraska Sta. Bul. 265 (1932), pp. 32, fig. 1*).—This bulletin summarizes the results of 77 tractor tests and includes data on all tractors reported by their manufacturers as on the market January 1, 1932. A new column has been added to the summary of test data to show the code drawbar and belt rating. A set of three columns also is included to accommodate the fourth gear on two tractors tested in 1931.

**[Agricultural engineering investigations at the Mississippi Station],** T. N. JONES (*Mississippi Sta. Rpt. 1931, pp. 7–9*).—Experiments on the mechanical features of hay curing indicated the value of a side delivery rake and hay loader in reducing the necessary man labor. A brief description of the set-up for power and tillage studies is included.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**Management factors that influence farm profits in southwest Illinois,** R. H. WILCOX, C. W. CRICKMAN, and R. G. TRUMMEL (*Illinois Sta. Bul. 374 (1931), pp. 409–468, figs. 19*).—This bulletin analyzes and measures the important management factors causing differences in incomes among farms in the dairy and wheat area of Illinois neighboring St. Louis, Mo. It is based chiefly on data for 1927 obtained from farm account books kept on 114 farms for different periods of years from 1918 to 1928. A detailed cost-accounting study was also made of from 18 to 20 farms in Clinton County, one of the counties included in the area, each year from 1926 to 1928, inclusive. The soils, products, size of farms, and other agricultural conditions of the area are described.

Tables are included showing for the year 1927 for the 114 farms, the 23 most profitable farms, and the 23 least profitable farms, the average earnings; yields per acre of corn, oats, wheat, and hay; the acreages in different crops; amounts and sources of farm income; and the investment in productive livestock and the returns per $100 so invested. Other tables and charts based on the Clinton County cost-accounting records present facts as to the volume of farm business, costs of production of crops and livestock, distribution of man labor and horse work, expenses for buildings and equipment, etc. The methods and practices on 5 farms on which a higher than average standard of success has been attained are described briefly.

Placing the 23 most profitable and the 23 least profitable farms on the same size basis, the average difference per farm in net income was $2,332. The more profitable farms had higher incomes as follows: From crop yields $943, efficiency of livestock $903, amount of livestock $340, kind of crops $298, and from unmeasured factors $200. These were offset in part by $157 higher cost for man labor, $73 higher cost for power, machinery, and equipment, and $122 higher expenditures for other expenses. A classification of the farms on the basis of the number of the seven factors in which they excelled showed the average rate earned on capital invested increased from −1.96 per cent for the farms excelling in but one factor to 8.29 per cent for those excelling in six factors.

This study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

**Dairy farm organization in southeastern Kansas,** J. A. HODGES, R. S. KIFER, and R. D. NICHOLS (*Kansas Sta. Bul. 255 (1931), pp. 77, figs. 15*).—This study, made in cooperation with the Bureau of Agricultural Economics, U. S.

D. A., is based primarily on detailed farm records and accounts for 21 Bourbon County dairy farms in 1925 and 15 of the same farms in 1926. Its purpose is to point out some of the significant factors contributing to the success or failure of dairy farms in the section and to suggest more profitable systems of dairy farming than those now followed.

The development of the present type of farming in the area is described. The organization on the dairy farms studied, crops and livestock, distribution of investment, income and expenses, and the variations in earnings are discussed. Analysis is made of the feed and labor used on the several farms in dairy production and in producing other cattle, poultry, hogs, work horses and other horses, and of the labor and material used in producing different crops.

Using the probable requirements of materials and labor for crop production and the quantities of feed and labor most likely to be used in livestock production as developed in the analysis and prices of farm products and materials arrived at by a study of local prices during a period of years, organizations are suggested for a 160-acre, an 80-acre, and a 320-acre farm, and tables given showing the probable crop and livestock production, the use of crops and livestock products, and the distribution of man labor under the several suggested systems. Comparisons are made of the organization and returns from the farms under suggested systems and under typical existing systems.

**Systems of farming in eastern and southern Minnesota,** L. F. Garey and F. F. Elliott (*Minnesota Sta. Bul. 276* (*1931*), *pp. 50, figs. 9*).—This bulletin is supplementary to one previously noted (E. S. R., 62, p. 677) and applies to areas 1, 3, 4, and 5 of the previous study. It discusses for each area the shifts during the period 1879–1924 in crop and livestock production, the typical farm organizations in 1925, and how the results may be used in determining profitable long-time systems of farming.

**A two-year analysis of farm organization practices in the Middle Rio Grande Conservancy District,** P. W. Cockerill and A. L. Walker (*New Mexico Sta. Bul. 196* (*1931*), *pp. 30, figs. 2*).—This is a preliminary report covering the first 2 years, 1929 and 1930, of a proposed 4- or 5-year economic study of the Middle Rio Grande Conservancy District. Data were obtained from 54 general, 12 fruit, 9 vegetable, 20 dairy, and 8 poultry farms. A business summary is included for each type of farm showing for each year and the 2-year average the average size of farm, acreage in crops, farm receipts and farm expenditures by items, farm income, labor income, and return on investment. Some analysis is made of the factors affecting net income with the different types of farming and of the amount of family living furnished by the farm. The situation in the area is summarized and some suggestions are made. Due to the fact that the investigations completed cover only 2 years and the fact that the period was one of unusual business conditions, little attempt is made to advance recommendations.

**Variations in livestock production costs and returns in Putnam County,** J. F. Dowler (*Ohio Sta. Bul. 495* (*1931*), *pp. 37, fig. 1*).—This bulletin analyzes the data on livestock production collected for the years 1926–1928 from the same 23 farms for which crop production costs have been previously noted (E. S. R., 65, p. 883). Tables are included showing, by items, the costs in producing pork, keeping or raising dairy cows, bulls, heifers, and calves, and costs of producing beef, mutton and wool, and poultry and eggs. Analysis is made of some of the factors affecting the different costs of production. Comparisons are made between farms grouped according to labor income or cost per dollar of receipts in the different enterprises.

The average costs of production per unit on the 5 farms with the highest labor income, the 5 farms with the lowest labor income, and the 23 farms were for pork per 100 lbs. $8.36, $9.34, and $8.89; butterfat per pound 39, 47, and 41 cts.; veal calf per head $23, $29.61, and $24.18; beef per 100 lbs. $13.15, no data given for the 5 farms with the lowest labor income, and $12.79; wool per pound 23, 36, and 28 cts.; and eggs per dozen 25, 35, and 26 cts., respectively. The average labor incomes were $2,133, $378, and $1,110, respectively. The returns from the different enterprises per dollar of total cost were for dairy cattle $1.30, 90 cts., and $1.08; beef cattle 98 cts., no data, and 97 cts.; hogs $1.14, $1.06, and $1.08; sheep $1.85, $1.06, and $1.50; and poultry $1.14, 84 cts., and $1.09, respectively.

**Studies in Vermont dairy farming.—VII, Charlotte, Ferrisburg, and Panton area,** H. P. Young (*Vermont Sta. Bul. 329 (1931), pp. 30*).—This bulletin is the seventh of the series previously noted (E. S. R., 62, p. 782). The data were secured from 195 farms in a farm organization and cost of milk production study covering the year ended April 30, 1927. The area, types of farming, farm practices, etc., are described. The relations to labor incomes of size of business, acreage in crops, number of cows, number of man work units, efficiency of labor, number of months of man labor employed, area in and yields of hay, milk production, production of milk of A and B grades, and other factors are discussed.

Correlations are made of the relation of labor incomes to pounds of milk produced per cow, percentage of alfalfa and clover in the hay ration, coefficient of the variability of the monthly sales of milk, percentage of crop land in hay, man work units per man, percentage of manure applied to hay land, and cost of production of milk per 100 lbs.; and of the cost of producing 100 lbs. of milk to pounds of milk per cow, percentage of alfalfa and clover in the hay ration, coefficient of the variability of sales, percentage of butterfat in milk, pounds of grain fed per cow in winter, pounds of grain fed per cow in summer, hours of labor per cow in winter, and hours of labor per cow in summer.

The study showed that the region is well adapted to fluid milk production, but as a whole is underdeveloped. The labor incomes of grade A milk producers averaged more than twice those of grade B milk producers. The optimum size of business required 120 acres or more of crop land and 30 or more cows. Under present conditions apparently not much more than 12 months of man labor besides that of the operator can be profitably employed even with 30 or more cows. The use of leguminous hays lowered the cost of milk production and was an important factor affecting labor income. Growing of hay in excess of home needs and forcing high grass yields in excess of such needs were found unprofitable. Increasing the number of cows per farm augmented labor incomes, and with such increase expansion of hay production will prove profitable. Increased production of alfalfa and clover within the limits of home usage is likely to prove profitable. In general, the herds with the most even milk production throughout the year showed the most milk per cow, milk produced at the lowest cost, and a greater profit. To secure increased evenness of production, a shift in freshening dates from March and April to May, June, and July, and from November and December to September and October is necessary. Apparently it costs about 7.5 cts. per 100 lbs. of milk to raise butterfat content by 0.1 per cent. The premium paid by dealers for such increase in butterfat content is 4 cts., consequently under present conditions it does not appear advisable for market milk producers to produce milk that materially exceeds the minimum legal standard.

**Cooperative creamery operation in Vermont,** O. M. Camburn (*Vermont Sta. Bul. 335 (1931), pp. 55*).—A study was made of the internal operations of 6 cooperative creameries, the data being secured by visits to each plant at least 12 times during the year studied. Tables are included and discussed showing for each creamery, by items, the total operating costs, and plant operating, overhead, and receiving room costs, total and per 100 lbs. of milk; distribution of annual land and building costs, equipment costs, wages, and electricity costs: costs of generating steam, testing, handling milk shipped, separating and handling patrons' cream, handling shipped cream, manufacturing butter, condensing skim milk, and manufacturing casein. Other tables show the operating costs by products, and the man labor, total and per 1,000 lbs., used in handling shipping milk, separating milk, handling cream, and manufacturing products.

Total operating costs averaged 50.73 cts. per 100 lbs. of milk for the 2 creameries receiving less than 6,000,000 lbs. of milk per year, 34.17 cts. for the 2 receiving between 10,000,000 and 15,000,000 lbs., and 41.21 cts. for the 2 receiving between 17,000,000 and 20,000,000 lbs. The average percentage distribution of wages was for receiving room 20.22, milk handling 24.74, cream handling 9.04, butter department 10.14, condensing 2.9, cheese 5.38, casein 3.28, ice house 2.82, refrigeration 1.79, boiler 7.87, testing 7.93, repairs 3.44, and office records 0.45.

The costs per 100 lbs. of separating milk and handling the cream averaged 33.84 cts. for the creameries separating less than 2,000,000 lbs. and 17.35 cts. for those averaging 6,000,000 lbs., being 25.59 cts. for the 6 creameries. Excluding the cost of steam engine operation, the cost of generating steam averaged 4.99 cts. per 100 lbs. of milk, of which approximately 2 cts. was for manufactured products, 1 ct. for cream, and 2 cts. for milk. Testing room costs averaged 1.28 cts. per 100 lbs. of milk, receiving room costs 5.51 cts., and net milk handling costs, exclusive of office and management costs, 23.98. The average cost of making butter was 9.41 cts. per pound when less than 100,000 lbs. were made, and 6.72 cts. when 123,000 to 164,000 lbs. were made. Making plain condensed skim milk cost an average of 1.24 cts. per pound, and making dried casein 4.8 cts. per pound. Low tonnage of milk handled increased per unit costs, and the manufacture of many kinds of products increased total costs.

**The trend of real estate taxation in Kansas from 1910 to 1929,** H. Howe (*Kansas Sta. Circ. 159 (1931), pp. 16, figs. 10*).—This circular brings up to date certain of the data previously noted (E. S. R., 54, p. 483) and summarizes some of the important facts for the period 1910–1929. Tables and charts are included showing by years for farm real estate and for city real estate the amounts and percentages of total and the indexes (base = 1910–1914) of taxes for State government and for subdivisions of the State; the percentages that taxes were of calculated selling value of real estate in the different farm areas of the State; and the amounts and percentages of total taxes for different purposes by years 1916–1929.

The tax indexes increased from 89 in 1910 to 268 in 1929 for farm real estate, and from 84 to 369 for city real estate. Since 1922 the rate of increase for both types has been more gradual and that for farm real estate slightly less rapid than that for city real estate. Taxes on farm real estate increased from 0.53 per cent of calculated values in 1910 to 1.19 per cent in 1929. The increase on city real estate was from 1.07 to 2.53 per cent. The increases in both cases varied considerably in the different types of farming areas. Expenditures for education and roads, particularly education, were the principal causes of the rapidly rising tax levies. Comparatively, the cost of government administration increased but slightly. The study shows high real estate taxes to be as great, if not a greater, problem for the owner of city real estate as for the farm owner.

**Some aspects of the forest tax problem in selected towns of Wisconsin,** D. Pingree (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 15*

(*1931*), *pp.* [*3*]+*25*, *fig. 1*).—This is a study made in 1926–1927 in cooperation with the College of Agriculture of the University of Wisconsin of 9 representative Wisconsin towns in different counties and all of Lincoln County to discover the extent to which the taxation of real estate has influenced the general lack of forestry practice and to obtain physical and tax data that might aid in testing alternative forest tax systems. Information was obtained on the present use and ownership of unplatted real estate; changes in use and ownership in recent years; character of the soil, degree of slope and stoniness, and drainage conditions; class of forest cover; assessed value, taxes, and delinquency in tax payments; and details of recent sales of unplatted real estate. Some miscellaneous secondary data were also obtained. The data are presented in 6 tables for each of the 9 towns and in 4 tables for each of the 7 groups of towns into which Lincoln County was divided.

The bulletin by Hibbard et al. previously noted (E. S. R., 61, p. 381) covers much of the work done in Lincoln County.

**Agricultural outlook for Illinois, 1932** (*Illinois Sta. Circ. 387* (*1932*), *pp. 36*, *figs. 9*).—This circular gives pertinent facts bearing on the agricultural situation and points out trends with reference to the supply of and demand for agricultural products. It is based largely on data prepared by the U. S. Department of Agriculture in cooperation with 31 State colleges of agriculture and the Federal Farm Board.

**Judging price risks in marketing cattle,** H. J. HENNEY (*Kansas Sta. Circ. 158* (*1931*), *pp. 43*, *figs. 16*).—Charts are included and their use discussed, showing for each month for the period 1908–1930 the risks in marketing (i. e. the price advance or decline 60 days later) fat cattle 1,100 lbs. down and choice stockers 750 lbs. down. The effect of corn production on cattle price changes is also discussed. Appendixes include tables showing (1) the number of years the price of fat cattle and stocker cattle advanced or declined for 60 days after each month of the year; (2) the yearly average price, 1908–1930, for fat cattle in Kansas City; (3) the weekly top price at Kansas City of fat steers and choice stockers, 1908–1930; and (4) the annual corn production, 1901–1930, in Kansas, in 8 Corn Belt States, and in the United States.

**Wool marketing,** A. H. BENTON (*North Dakota Sta. Bul. 252* (*1931*), *pp. 46*, *figs. 16*).—Statistics and charts are included showing the number of sheep, wool production, and population of the United States by years, 1870–1930; production, imports, and consumption of wool in the United States by years, 1921–1930; annual per capita consumption and prices of grease wool excluding carpet wool, cotton, rayon yarn, and raw silk in the United States, 1921–1930; number of sheep, production of wool, and farm price of wool in North Dakota, 1920–1930; and prices for medium and fine grades of wool in Boston and London, 1921–1930. Wool marketing methods in the United States, the marketing classes of domestic wool, and the factors—grade, condition, and character—determining market value of wool are described. The origin, organization, method of operation, and marketing costs of the North Dakota Cooperative Wool Marketing Association are described and discussed, and wool shrinkage tables and a glossary of wool terms are appended.

**Corn futures** (*U. S. Dept. Agr., Statis. Bul. 34* (*1931*), *pp. 202*, *figs. 9*).—This bulletin gives the same type of information for corn futures as was previously noted for wheat futures (E. S. R., 64, p. 788). The material relates almost entirely to trading in the principal corn futures on the Chicago Board of Trade, which constitutes approximately 93 per cent of such trading in the United States, and covers the period from January 3, 1921, to December 31, 1929.

**Some factors influencing the mid-season potato market,** E. A. STOKDYK (*Kansas Sta. Tech. Bul. 28* (*1931*), *pp. 104*, *figs. 24*).—The factors affecting the market for any commodity, the areas supplying the mid-season potato market, the period of that market, and the marketing conditions in the various sections of the mid-season potato area are discussed. Analysis is made of the influences on the prices of mid-season potatoes of total supplies, position of the supplies, movement to market. and the Chicago market; and of the influence of shipments from the principal mid-season producing sections and of total shipments on Chicago receipts. The needs of consuming sections, the influence of quality and grade on demand, and some means of improving the marketing situation for mid-season potatoes are discussed. An appendix shows the statistical calculations and the results for particular data. Some of the findings follow:

In 5 of the 8 years 1921–1928 an increase or decrease in the acreage of potatoes in the particular mid-season potato districts was accompanied by an increase or decrease in production. A correlation coefficient of +0.645 was found between acreage and production. A correlation coefficient of +0.888 was found between production and carload shipments. Estimates of shipments based on this coefficient showed an average error of 6.14 per cent, which was reduced to 3.59 per cent when weight was given to the total United States production factor. A coefficient of —0.779 was found between carload shipments from the principal districts supplying the mid-season potato market and average prices for the season at Chicago. Estimates of prices based on this coefficient showed an average error of 21 cts. per 100 lbs., which was reduced to 12 cts. when the total United States production factor was considered.

The position of supplies was usually not of great importance in the mid-season market, but in some years it assumed considerable importance. The usual seasonal price trend of mid-season potatoes is downward from early July to the first part of August. The first part of August is usually a period of price recovery. The middle of August shows price rises about one-half the time, and the latter part of August most frequently shows declining prices.

Daily Chicago prices are influenced considerably by daily receipts. Shipments from the Eastern Shore of Virginia, the Kaw Valley of Kansas, and the Orrick district of Missouri are responsible to a considerable extent for the fluctuation of such receipts. The Chicago market dominates other markets to a marked degree. No apparent relation was found between daily receipts at Chicago and total United States shipments made 1, 2, 3, 4, or 5 days previously. The spread between the prices of different grades of potatoes varies from year to year as the quantity of the lower grades varies in proportion to the quantity of the higher grades. Proper grading has resulted in higher net returns to Kansas potato growers, 3 years' records showing that No. 1 potatoes sold for a higher price than partly graded potatoes from 70 to 80 per cent of the time. Of the total crop harvested in the Kaw Valley, approximately 88 per cent graded U. S. No. 1. The needs of areas consuming mid-season potatoes are affected from year to year by the size of home-grown crops and the earliness or lateness of the crops in the early and late producing areas. Careful grading is highly important if a broad market outlet is to be obtained.

Limitation of supplies by means of acreage reduction campaigns, imposition of severe grading regulations, and restriction of shipments to superior grades were found to offer little possibility as a means of improving a marketing situation because of the variance of the interests of individuals or groups of individuals and those of the group as a whole. "Intentions to plant" reports as issued by the U. S. D. A. Bureau of Agricultural Economics offer the best possibilities in this direction. Controlling the flow of the product to eliminate market gluts and to eliminate cross hauling offers possibilities for improving the market situation in the mid-season potato market. Cooperatives operating in the mid-season potato producing sections have not been able to secure sufficient control of the product to be able to regulate the flow to market or exert the desired degree of price stabilization. The clearing-house association and minimum-quotation plan offer possibilities to improve the potato marketing situation. An "estimate of arrivals" service would be advantageous to potato shippers but would be dependent upon their cooperation in reporting promptly billings and diversions.

A plan is proposed embodying the organization of growers into strong local units, the organization of these units into a clearing-house association, and the cooperation of these associations among themselves and with the Market News Service.

**The Indianapolis apple market, 1929–30 apple crop,** F. C. Gaylord and H. M. Cleaver (*Indiana Sta. Bul. 352* (*1931*), *pp. 24*, *figs. 4*).—This bulletin reports the results of a survey similar to that previously noted (E. S. R., 59, p. 786), made with a view of ascertaining the changes from 1926 to the crop year 1929–30 and of obtaining data regarding the Indianapolis market in a year of light local apple production. The information was obtained by personal interviews with wholesale dealers, buyers for 3 chain-store organizations, and 70 independent retail grocers. The quantity of apples marketed, sources of supply, varieties received from local sources and in carloads, varieties handled by chain stores and independent retailers and used by fruit stands, peddlers, and restaurants, and the receipts by types of containers are discussed. Analysis is made of consumers' preferences as to variety, size, type of container, etc., as shown by returns from 600 questionnaires, the consumers being classified according to 4 income groups, wealthy, medium, poor, and colored.

Indiana in 1929 furnished only 10 to 15 per cent of the Indianapolis apple supply, as compared with 30 to 35 per cent in 1926, a full crop year. In 1929 6 per cent of the supply was received in barrels, 33.7 per cent in boxes, and 54.5 per cent in bushel baskets, as compared with 33.4, 31.4, and 30.6 per cent, respectively, in 1926. In 1929. 46.8 per cent of the car-lot receipts were sold through jobbers as compared with 61 per cent in 1926. The retail trade was found to prefer an apple sized to 0.25-in. ranges rather than to a 2.25- or 2.5-in. minimum. The greatest preference expressed by consumers for both cooking and eating apples was for the Grimes Golden variety, with the Winesap variety second. Knowledge of varieties apparently increased with the standard of living of the individual, as did also the practice of buying a winter supply in the fall. There was a slightly greater tendency on the part of the wealthy and colored groups than on the part of the medium and poor groups to buy apples from boxes.

The study indicated that Indiana growers would profit by growing fewer varieties and by giving more attention to proper pruning, spraying, and cultural practices, and that apples should be packed in tub baskets, graded according to U. S. grades, and sized to 0.25-in. ranges.

**Factors affecting annual prices of California fresh grapes, 1921–1929,** L. D. Mallory, S. R. Smith, and S. W. Shear (*Hilgardia* [*California Sta.*], *6* (*1931*), *No. 4*, *pp. 101–130*, *figs. 8*).—This paper presents the results of an analysis designed to discover and measure the influence of the major factors affecting the season's prices for table, black-juice, and white-juice grapes.

Tables are included showing the annual shipments and New York-delivered auction prices of California table grapes and grape shipments to other States, 1921–1929; the weekly New York-delivered auction prices and interstate shipments in carloads and in percentage of season's total of California table grapes, 1926–1929; the annual shipments and actual and adjusted New York-delivered auction prices of California black-juice grapes, 1921–1929; the weekly prices, auction sales, and shipments of black-juice grapes and shipments of Muscats, 1925 and 1926; the weekly shipments of black-juice grapes and unloads and prices in New York and weekly Muscat shipments, 1927–1929; the annual shipments and actual and adjusted New York-delivered auction prices of California Muscat grapes, 1921–1929; and the opening prices of fresh and dried Muscat grapes.

Charts are included showing the relation of shipments of table grapes to adjusted New York prices, 1921–1929; the weekly New York prices and shipments of California table grapes, 1926–1929; the relation of black-juice grape shipments to adjusted New York prices, 1921–1929; the weekly New York temperatures, Muscat shipments and black-juice shipments, auction sales and prices, 1925 and 1926; the weekly New York temperatures, Muscat shipments and black-juice shipments, unloads and prices, 1927 and 1928; the estimated expenditures for juice grapes in eastern markets, 1921–1929; the relation of Muscat grape shipments to adjusted New York prices, 1921-1929; and the relation of opening prices of fresh Muscats to opening price of dried raisins and to fresh Muscat shipments, 1923-1929.

The chief factor determining the annual average adjusted price of each of the three classes of grapes was the total shipments during the season. This factor was much more influential in the case of table grapes than in the case of black-juice grapes or Muscats, primarily because table-grape shipments have been better timed to the current needs of eastern markets.

The demand for table grapes was found to be somewhat inelastic. The price of table grapes appeared to have been affected but little by changes in the proportion of total California shipments consisting of black-juice and white-juice grapes. The volume of eastern grape shipments usually had little influence on the prices of California table grapes. There were some indications that the earliness or lateness of the bulk of market arrivals of eastern grapes in relation to California arrivals may affect the influence of season's total supplies of labrusca grapes on California table-grape prices. Current weekly prices in eastern markets were affected not only by current shipments, but also, during the greater part of the shipping season, by total shipments expected during the whole season.

The elasticity of demand for black-juice grapes was found to vary from about 0.8 to 0.9 with variations in shipments from about 25,000 to 31,000 carloads. Timing of early black-juice shipments to demand in eastern markets, volume and timing of Muscat shipments, and quality of black-juice stock were found to be the more important factors, other than the season's volume, affecting black-juice prices.

The elasticity of demand for fresh Muscat grapes varied from about 2 with shipments of 8,000 to 10,000 carloads of Muscats to about 1.4 with shipments of 15.000 carloads or somewhat less. The most important factors other than shipments were timing of Muscat shipments to demand. the quantity ratio between black-juice grapes and Muscat shipments, the quality, and the general price level.

Temperature appeared to have greatly influenced the sale and movement into consumption of both fresh Muscats and black-juice grapes in eastern markets. There has also been a tendency for the prices for fresh Muscats and Muscat raisins to strike at some equality.

**Factors affecting California raisin sales and prices, 1922–1929,** S. W. SHEAR and R. M. HOWE (*Hilgardia* [*California Sta.*], *6* (*1931*), *No. 4*, *pp. 73–100, figs. 7*).—This study was made by the Giannini Foundation of Agricultural Economics in cooperation with the Federal Farm Board. Tables and charts are presented showing, by years 1921 to 1929 or 1930, for California raisins the sales in the United States, Canada, the United Kingdom, and other countries; the percentages of production and unshipped stocks on September 1, by varieties; and the f. o. b. prices. Other tables and charts show the annual world production of raisins, 1921–1930, by countries; the United Kingdom imports, 1921–1929, by chief countries of origin; the production, United Kingdom imports, and declared import values per pound of Australian raisins; and the United Kingdom declared import value per pound of raisins, by chief countries of origin, 1922–1929. A chart is given showing the relation between the quantity and f. o. b. rail prices of domestic sales, including Canada, of California raisins (1) in years when demand conditions were probably more favorable than the expected average for several years, (2) in years when demand conditions were less favorable than the average, and (3) in years with general business conditions as adverse as in 1929. Other charts show the relation of California overseas raisin exports to f. o. b. export prices and to the excess of United Kingdom import values per pound, duty added, of California raisins over Australian raisins. The competition with California raisins in the United Kingdom in the several years is discussed.

The curve for relation of quantity and price of domestic sales shows that the domestic demand for raisins is inelastic, and therefore a relatively drastic cut in price is necessary to increase consumption substantially. Large supplies return a smaller income to the industry than small supplies. The study of the United Kingdom imports indicates that when the prices of Australian raisins exceed California prices in the United Kingdom market, California exports tend to increase about 10,000 tons for each cent of the differential. A table shows the approximate domestic and foreign sales of California raisins under adverse and moderately favorable demand conditions in the domestic market and under foreign competitive conditions in which the United Kingdom import price, duty added, is the same for both Australia and California.

The needed current statistical data in making use of the methods and results of the present analysis are discussed.

**Car-lot shipments of fruits and vegetables from stations in the United States for the calendar years 1928 and 1929**, compiled by L. NORGREN (*U. S. Dept. Agr., Statis. Bul. 35* (*1931*), *pp. 152*).—This bulletin includes for the years 1928 and 1929 tables similar to those previously noted (E. S. R., 62, p. 887).

**Crops and Markets, [December, 1931]** (*U. S. Dept. Agr., Crops and Markets, 8* (*1931*), *No. 12, pp. 497–568, figs. 3*).—Tables, charts, notes, reports, and summaries of the usual types are included. Tables are also given showing for 1929, 1930, and 1931, by States, the acreage, yield per acre, production, farm price December 1, and total value on basis of December 1 price of different grains, forage crops, fruits and vegetables, nuts, tobacco, cotton, cottonseed, and hay; the estimated commercial acreage, yield per acre, production, seasonal farm price, and total value of different vegetables, 1929, 1930, and 1931; and, by years 1928–1931 and by States, the acreage, yield, production, seasonal farm price per unit, and farm value of different truck crops for shipment.

**The analysis of social data**, H. J. BURT (*Missouri Sta. Research Bul. 155* (*1931*), *pp. 88, figs. 7*).—This bulletin is primarily a study of research methods of analysis made possible or practicable with the selecto-meter, a new machine developed by the author for counting and combining statistical data. The functions and structure of the machine and the principles of tabulating and counting with it are described. In demonstrating the use of the machine, the data obtained in the study previously noted (E. S. R., 63, p. 87) were used.

The preparation of correlation tables and the computation of coefficients of correlation are described and illustrated. The reasons for the inefficiency of the coefficient method, the condensed distribution method of correlation, and the application of the latter method to problems of partial correlation are discussed. Using the condensed distribution method, the relation of religious contacts experienced within the community to (1) social contacts, (2) recreational contacts, and (3) educational contacts within the community is determined. The use of the machine in handling combinations of factors is illustrated by the presentation of a general method of the study of combinations of four selected factors—age, sex, number of persons in the household, and distance from the village—associated with a given form of behavior, religious contacts within the community. Some of the theoretical problems in social research are outlined under the headings of the complex nature of social behavior, the "chemical analysis" of social behavior, the significance of functional combinations, and the search for social constants.

The numerical relationships and functional facts and relationships, the leading points in the methodology and the principles demonstrated or implied in the study are summarized. Appendixes include discussions of the use of the zero step-interval, the method used to superimpose a normal curve on an obtained curve, modal dominance, spurious correlation, and a summary of previous efforts to apply chance occurrence to combinations of social data.

The author summarizes his findings and conclusions as follows:

"This machine, called the selecto-meter, facilitates the process of correlation by making it possible to use, on a large scale, the condensed distribution method. Comparisons indicate that this method is more useful in showing relationships than is the usual Pearsonian technic of correlation. The latter is based on assumptions which apparently do not hold true for most social data. In problems of partial correlation the machine technic holds a factor constant experimentally, thus eliminating the need for the technical process of partial correlation and giving the relationship between two variables in terms of the successive step-intervals of the constant. This is shown to be a simpler and more effective method.

"In addition to these services the machine opens a new field of research analysis through its ability to handle combinations, thus permitting a functional analysis of social behavior as distinct from the usual numerical analysis. Combinations of the four factors, sex, age, number of persons in the household, and distance from the village center, are used to show what specific combinations are associated with the respective degrees of a selected form of behavior. Three hundred forty-three separate combinations of these factors were found in the 576 cases studied. The ratio of the actual occurrence of these combinations to their chance of occurrence was used as a common denominator, or norm of social measurement, to eliminate the element of chance. By the use of the functional combinations thus discovered it was possible to construct a prediction table by means of which the behavior of the people could be predicted, on the average, with perfect accuracy, knowing the sex, age, number of persons in the household, and distance from the village of each person. It was found that certain factors are associated (with a given form of behavior) differently in functional combination with other factors than when taken singly, thus challenging the validity of the usual numerical processes of gross, partial, and multiple correlation as mehods of social analysis."

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**The effect of extension education on the seasonal surplus milk problem in Addison County, Vermont, J. E. Carrigan** (*Vermont Sta. Bul. 330 (1931), pp. 26*).—This bulletin presents the results of a study made to determine whether the extension service in Addison County, where a relatively intensive extension program was conducted, had helped farmers to solve the seasonal milk production problem, in what manner and to what extent farmers have been helped, and how in the future the extension service could more effectively function in solving similar problems. The problems in adjusting milk production in the area, the extension educational program, the extension methods used, and some of the results obtained are discussed. Comparisons are made with Lamoille County, a county with very little extension work, on the problem of adjusting milk production to demand, and with the State as a whole.

From 1926 to 1929 Addison County made greater progress than Lamoille County or the State as a whole in adjusting milk production, and had producers throughout the Boston and New York milk sheds made as great adjustments the increased demand in the two markets could have been met without extending the milk sheds. The greater progress in Addison County was made among dairymen given special price inducements and by those who remembered being reached by extension methods. On the 125 farms from which records were obtained there were shifts from winter and spring freshening to late summer and fall freshening, cows were stabled earlier in the fall, and more concentrate feeds were fed during the pasture season, all practices suggested by the extension service.

## FOODS—HUMAN NUTRITION

**The occurrence of naringin in marmalade made from South African grape fruit,** B. Segal and T. de Kiewiet (*Jour. So. African Chem. Inst., 14 (1931), No. 2, pp. 43–46*).—White spots occasionally appearing in grapefruit marmalade made in a factory in the Transvaal were identified as clusters or crystals of the glucoside naringin. On immersing the bottled product in boiling water for several hours the crystals disappear and do not form again.

**Growth of preschool children** (*Georgia Sta. Rpt. 1931, pp. 48–50*).—A brief report is given of the beneficial effects secured in a group of preschool children in an orphanage in Macon, Ga., as the result of slight changes in the diet consisting of a more even distribution of fruits, vegetables, eggs, and other foodstuffs throughout the entire year and the addition of cod-liver oil and concentrated orange juice to the diet in the four winter months. Among the points noted were greater alertness in the children who had previously been rather listless, an increase in the general resistance to colds and children's diseases, and a reduction in the prevalence of skin infections of an unknown cause.

**Nitrogen metabolism in infants on graded intake of soybean " milk " proteins,** E. Tso and F. T. Chu (*Chinese Jour. Physiol., 5 (1931), No. 3, pp. 287–294, figs. 2*).—An extension of the nitrogen metabolism studies on infants receiving soybean milk (E. S. R., 64, p. 584) is reported, with results confirming the previous conclusion of a lower utilization of soybean milk nitrogen than of cow's milk nitrogen. It is estimated that approximately 80 per cent of the ingested nitrogen of soybean milk and 95 per cent of that of cow's milk are utilized. It is thought that on soybean milk feeding furnishing from 120 to 150 calories per kilogram of body weight, 18 per cent of the caloric intake in proteins provides for adequate retention of nitrogen to meet the growth requirements of early infancy.

A description, with photographic illustrations, is given of the metabolism bed employed.

**The effect of coffee upon the basal metabolism of young women,** H. Hackett (*Jour. Home Econ., 23 (1931), No. 8, pp. 769–775*).—As a means of determining the effect of daily drinking of coffee upon basal metabolism, the author selected 30 college women, 15 of whom never drank coffee and 15 drank it daily at breakfast and occasionally at other times. All of the subjects were within 10 per cent above or below the standard weight for height and age and were apparently in good health. Basal metabolism studies were conducted on these subjects with the Benedict-Roth recording apparatus. Two observations were made on each subject on two different days.

The average metabolism of the group drinking no coffee was 50.19 calories per person per hour and of the coffee drinking group 53.16 calories per person per hour. In comparison with the customary standards for women, lowered by 5 per cent as suggested by Benedict (E. S. R., 60, p. 389), the average metabolism for the group not drinking coffee was 11.6 per cent below the Aub-Du Bois and 9 per cent below the Harris-Benedict standards, while corresponding values for the coffee drinkers were 8.3 and 5.1 per cent below these standards. A further examination of the data showed that there were more individual subjects among the coffee drinkers than the other group who were above or not more than 10 per cent below these standards. The values were also compared with those of other metabolism studies made on groups of young women, with the general conclusion that "the drinking of coffee over a period of years has a tendency to raise slightly the basal metabolism of normal young women."

**The production of dental caries in rats fed an adequate diet,** C. A. Hoppert, P. A. Webber, and T. L. Canniff (*Science, 74 (1931), No. 1907, pp. 77, 78*).—Following the discovery of dental caries in rats on a stock ration of yellow corn 60, whole milk powder 30, linseed meal 6, alfalfa meal 3, and sodium chloride 1 per cent, it was observed that impaction of the corn meal particles occurred usually in the lower molars, and that this was followed in a few weeks by the formation of small but growing cavities which resulted in many cases in the complete destruction of the molars. When corn meal of varying degrees of fineness was used, it was found that its tendency to become impacted on the teeth was primarily a function of the size of the particles. A group of rats receiving the stock ration containing corn meal ground to pass through a 60-mesh screen showed no evidence of tooth decay in 6 months, while in another group receiving fairly coarse meal as supplied by a milling concern caries was initiated at about 8 weeks, and at 6 months practically all of the lower molars were extensively decayed. Attempts to prevent the decay by various dietary supplements were without avail.

These results are thought to furnish strong support of the earlier view that "the cause of dental decay is the decomposition, most likely by aciduric and acidogenic bacteria, of certain foodstuffs held by the teeth in some way or other." In attempting to reconcile this view with more recent theories, it is suggested that the increase in the diet of the so-called protective foods probably reduces the consumption of the foods which have a tendency to be retained by the teeth, and that certain fruits, fruit juices, and vegetables may also have a definite cleansing action.

**A preliminary note on the significance of the phosphorus intake in the diet and blood phosphorus concentration, in the experimental production of caries-immunity and caries-susceptibility in the rat,** H. Klein and E. V. McCollum (*Science, 74 (1931), No. 1930, pp. 662–664*).—Exception is taken to the conclusion of Hoppert, Webber, and Canniff, noted above, that the dental caries occurring in rats on a diet containing whole ground corn is due to impaction of the food material between the teeth. In the authors' opinion the cause is the lower phosphorus content of the whole than of the finely ground corn. Calculations of the calcium and phosphorus content of the three diets used by Hoppert et al. showed that although the ratio of Ca : P was practically the same in all of the diets the absolute amount of phosphorus was considerably lower in the whole corn than in the corn siftings or oatmeal.

It is also noted that in the McCollum laboratory observations during the past two years have shown that 88 per cent of rats (entire number not stated) fed a diet containing 0.23 gm of phosphorus per 100 gm of diet showed dental caries at the end of 140 days of feeding, whereas 140 rats fed diets containing 0.41 gm of phosphorus per 100 gm of diet had a 5 per cent incidence of caries.

A relation was also found to exist between the content of phosphorus in the blood and the incidence of dental caries. The critical level of blood phosphorus below which caries occurs appeared to be about 10.5±0.5 mg per 100 gm of serum. The maintenance of a level of blood phosphorus above this value is dependent upon the level of phosphorus, calcium, and vitamin D in the diet.

**The relation of the lime and phosphoric acid in the feed to the growth and development of bones of white rats,** J. K. Blum (*Texas Sta. Bul. 441 (1931), pp. 18, fig. 1*).—Rats about 23 days old and weighing from 37 to 40 gm each were placed in separate cages and given a ration consisting of casein 20, dried yeast 10, starch 67.5, sodium chloride 1, and a salt mixture 1.5 parts, or the same ration with some of the starch replaced by varying amounts of calcium carbonate or disodium phosphate. The ration contained 0.25 per cent of lime (CaO) and 0.67 per cent of phosphoric acid ($P_2O_5$), equivalent to 0.178 per cent of calcium and 0.292 per cent of phosphorus. Each rat was given 3 or 4 drops of a vitamin tested cod-liver oil daily. Records were kept of the food consumption and gains in weight, and at the end of 8 weeks the rats were killed and the femurs analyzed for ash by the method of Dutcher et al. (E. S. R., 55, p. 387).

The ratio of CaO to $P_2O_5$ of 1 : 1 was found to be favorable for growth and bone development when the ration contained 1, 1.5, and 3 per cent of each mineral. Small deviations of either one from the favorable ratios decreased the growth, but did not always affect the ash content of the femurs. The minimum quantities in the ration to produce normal growth and good bone development were found to be 0.75 per cent of CaO and 1 per cent of $P_2O_5$.

In rats receiving 6 per cent of $P_2O_5$ with 1.5 per cent of CaO, growth was considerably decreased, the quantity of bone was excessively high in proportion to the total weight of the body, and the ash content of the femurs was practically normal. In rats receiving 6 per cent of CaO with 1.5 per cent of $P_2O_5$, normal growth and bone development occurred.

In a few samples of ash of the femurs the ratios of CaO to $P_2O_5$ were determined. Although the values obtained were not constant, there appeared to be no relation between the ratio of the two minerals in the ration and that in the femurs.

**Studies on nutritional anemia,** D. Dickins (*Mississippi Sta. Rpt. 1931, pp. 37–39*).—The results noted in this progress report (E. S. R., 64, p. 695) may be summarized as follows:

Dried ground turnip leaves when fed at a level of 0.25 mg of iron daily did not prove as effective as calves' liver fed at the same iron level in restoring hemoglobin in rats rendered anemic by milk feeding. A solution of the ash of turnip or mustard leaves in dilute hydrochloric acid proved more effective than the unashed dried leaves fed at the same level of iron intake for the same period of time. Freshly dried ground cowpeas fed at a level of 0.25 mg of iron proved more effective than calves' liver fed at the same level of iron, and this was also true of blackstrap molasses and the hydrochloric acid solution of the ash of the molasses.

A continuation of the studies on sorghum and sugarcane sirups (E. S. R., 66, p. 295) showed that either form of sirup cooked in a copper pan was more effective than the same sirups cooked in porcelain dishes or an iron pan. The addition of copper to a sample of sorghum sirup greatly increased its potency. The average iron content of 6 samples of sugarcane sirup cooked in a copper pan was 0.0014 and of 4 samples cooked in an iron pan 0.0072 per cent. The average iron content of 7 samples of sorghum sirup cooked in a copper pan was 0.0073 and of 12 samples cooked in an iron pan 0.0158 per cent.

**Nutritional anemia** (*Georgia Sta. Rpt. 1931, p. 48*).—In this brief progress report it is noted that the ash of turnip greens is very effective, and of collards quite effective in the treatment of nutritional anemia in rats When fed at the same iron level the hydrochloric acid extract of the ash of collards proved more effective than the dried ground collards.

**The effect of various heating processes on the vitamin A content of butter** [trans. title], A. SCHEUNERT and E. WAGNER (*Biochem. Ztschr., 236 (1931), No 1-3, pp. 29-34, figs. 2*).—Feeding experiments on rats are reported in which butterfat subjected to various common cooking processes was used as the sole source of vitamin A. It was concluded that in the process of baking, roasting, and browning there is no appreciable destruction of the vitamin, but that on prolonged heating in an open pan at temperatures of 160 to 200° C., as in deep fat cooking, a marked though not complete destruction of the vitamin results. It is pointed out, however, that for this process other fats are more suitable than butter.

**The question of the influence of carbohydrates on the development of polyneuritic avitaminosis in pigeons** [trans. title], B. JANOWSKAJA (*Biochem. Ztschr., 238 (1931), No. 1-3, pp. 125-130, figs. 2*).—The contention of Randoin and Simonnet (E. S. R., 52, p. 863) that pigeons on a carbohydrate-free diet do not require vitamin B was tested by a repetition of their feeding experiments, with great care in the purification of the carbohydrate-free diet. Under these conditions, the pigeons receiving the carbohydrate-free diet developed polyneuritis, although the survival period was somewhat longer on the diet containing carbohydrate. The author concludes that the survival and freedom from polyneuritis of the pigeons on the carbohydrate-free diet in the studies of Randoin and Simonnet was due to traces of vitamin B in the diet, and that the longer survival period in the present series of studies on the carbohydrate-free diet than on the one containing carbohydrates was probably due to the higher fat content of the former.

**Vitamin G in beef and veal**, P. L. DAY (*Jour. Home Econ., 23 (1931), No. 7, pp. 657-661, figs. 4*).—In this study the basal vitamin G-deficient diet used was that of Sherman and Spohn (E. S. R., 51, p. 368), modified by incorporating in it an alcoholic (80 per cent by weight) extract of rice polish to serve as the source of vitamin B ($B_1$) free from vitamin G ($B_2$). This extract was prepared by stirring 500 gm of rice polish with 1,500 cc of 80 per cent alcohol, allowing the mixture to stand 12 hours, and then filtering and washing the residue with 500 cc of the same solvent. The extract and washings were finally evaporated on starch and incorporated in the diet so that 100 gm of the diet contained the extract from 25 gm of the rice polish. The test animals were fed the basal diet alone until growth ceased (from 2 to 3 weeks), and were then given in addition graded amounts of the various materials. Composite growth curves are given for groups receiving beef round steak, heart, liver, and kidney, and veal round steak, liver, and kidney, and the values obtained are also expressed in relative concentration in terms of beef round steak taken as 1.

Veal steak appeared to be slightly richer in vitamin G than beef steak; beef heart contained about 3 times as much vitamin G as the round of beef; beef kidney, veal kidney, and veal liver from 8 to 10 times as much; and beef liver 10 times as much. It is noted that these values are in good agreement with those reported by Hoagland and Snider for the relative concentration of vitamin G in dried beef liver, kidney, and round steak (E. S. R., 63, p. 793).

**The alleged vitamin C content of coffee** [trans. title], A. SCHEUNERT and J. RESCHKE (*Klin. Wchnschr., 10 (1931), No. 31, pp. 1452-1454, figs. 7*).—Data are reported refuting earlier statements in the German press that coffee and coffee substitutes contain vitamin C in appreciable amounts. The materials tested included infusions of coffee, Kaffee Hag, and two cereal coffees, all of which gave negative tests for vitamin C.

**The antiscorbutic vitamin in home-canned carrots,** A. SPOHN and A. HUNTER (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 12*, *pp. 1101–1108*, *fig. 1*).—In this contribution from the New York State College of Home Economics data are reported on the vitamin C content, as determined by the preventive method of Sherman, La Mer, and Campbell, of raw carrots grown on sandy soil and harvested at 80 days and of carrots from the same lot canned a few days after harvesting. The carrots were canned by three different methods—cold packed with a small amount of vinegar and heated in a water bath for 90 minutes, and processed with and without vinegar in a steam pressure cooker for 40 minutes at 10 lbs. pressure.

The minimum protective dose against scurvy of the raw carrots was between 15 and 20 gm daily. The canned carrots retained very little of their original vitamin C potency, although the samples processed in the water bath were slightly more potent than those processed in the pressure cooker, as judged by slightly increased growth and longer survival periods of the guinea pigs. There were no measurable differences between the vitamin C potency of the carrots processed in the pressure cooker with and without added vinegar.

**The antiscorbutic vitamin in the juice of home-canned tomatoes,** A. SPOHN (*Jour. Agr. Research* [*U. S.*], *43* (*1931*), *No. 12*, *pp. 1109–1113*, *fig. 1*).—This study was undertaken to compare the effect of home canning on the vitamin C content of tomatoes (pH 4.09 to 4.16) with its destructive effect on carrots (pH 4.69 to 4.92) as noted above. Two varieties of tomatoes were used, Globe and Bonny Best. These were grown out of doors and vine ripened and were canned within a day after picking. The cold pack method was used, with processing in the water bath for 20 minutes. The filtered juice only was tested.

The minimum protective dose of the raw juice was 3.5 cc, while 4 cc of the canned juice did not prevent scurvy. Larger quantities were not fed.

**A criterion of hemorrhagic diathesis in experimental scurvy,** G. DALLDORF (*Jour. Expt. Med*, *53* (*1931*), *No. 2*, *pp. 289–297*, *figs. 2*).—The amount of negative pressure required to produce petechial hemorrhages in the skin has been found to serve as a rough measurement of the degree of scorbutic change in the vessels of guinea pigs with experimental scurvy and of the value of different substances administered as antiscorbutics. The response of the blood vessels to antiscorbutics was found to be extremely rapid, varying with the amount given and the method of administration. Intraperitoneal injection proved particularly satisfactory. The technic of the test, its limitations, and the possible nature of the reaction are discussed.

"The rapidity of the change in the vessel resistance strengthens the theory that the underlying mechanism in scurvy is a chemical alteration of intercellular substances, since it is difficult to suppose that cellular changes can occur so rapidly and since no discernible alteration in vessel structure occurred during recovery. The results of the experiment further suggest that the vitamin probably acts directly. The conception of Wolbach and Howe [E. S. R., 55, p. 388] that the reaction during healing is analogous to the setting of a gel is in accord with our results. The theory that the vessel lesion is inflammatory in nature appears untenable."

**Note on the subcutaneous administration of vitamin D,** J. C. DRUMMOND (*Lancet* [*London*], *1931*, *II*, *No. 17*, *p. 904*).—In view of existing uncertainty concerning the efficacy of preparations of vitamin D when administered parenterally, the author reports briefly the results obtained when colloidal solutions of irradiated ergosterol containing 0.1 mg per 100 cc were administered for 10 days by injection under the skin of the back to young rats which had developed marked rickets on the Steenbock-Black rachitogenic diet. Although 0.0001 mg of the preparation administered orally effected a rapid cure, a dosage of 0.001 mg administered subcutaneously was without marked effect. The author concludes that "the subcutaneous administration of vitamin D is of little or no value when compared with the oral."

**Note on the corn component of a rachitogenic diet, R. S. Harris and J. W. M. Bunker** (*Science, 73 (1931), No. 1882, p. 95*).—Attention is called briefly to irregularities which the authors have observed in the development of experimental rickets in rats on the Steenbock-Black diet 2965. These are thought to be due to traces of vitamin D in the yellow corn component of the diet, and as a remedy storage of the ground corn meal for six months before use is recommended.

**Vitamin D in whole corn, H. Goldblatt** (*Science, 73 (1931), No. 1897, pp. 494, 495*).—The author offers two other explanations than the ones suggested by Harris and Bunker, noted above, for irregularity in the development of rickets in rats on the Steenbock-Black diet 2965 and also on the McCollum diet 3143. One is the possible contamination of the cage by minute amounts of a very potent antirachitic substance which may have been used in a previous experiment. Another explanation is the settling out of the calcium carbonate of the diet. A method of obviating this latter difficulty in diet 3143 has been tested and found satisfactory. This consists simply in dissolving the gelatin which the diet contains in warm water (60 cc to every 15 gm of gelatin) and incorporating the other ingredients in the gelatin solution, with constant stirring, until the mixture forms a solid jelly. It is said that diet 3143 in this form is eaten regularly by young rats, and that a remarkably uniform degree of severe rickets is developed in the usual period of 4 weeks.

It is also noted that Shohl and Brown (unpublished) have recently modified diet 2965 by replacing 6 per cent of the corn by gelatin and incorporating the other ingredients in the jelly as outlined above.

**Experimental rickets and calcification of dentin, H. Becks and W. B. Ryder** (*Arch. Path., 12 (1931), No. 3, pp. 358–386, figs. 17*).—This is a detailed report, illustrated by microphotographs, of histological changes in the incisors of rats placed on the McCollum rachitogenic diet 3143 at about 25 days of age and killed for tooth examination after 7, 14, 21, 27, 28, 35, and 42 days on the diet.

The general conclusions drawn are that if the diet is maintained during the development of the teeth, marked pathological changes in the dentin occur which increase in extent and severity as the feeding period is prolonged. The changes, which are thought to be analogous to those produced in the long bones under the same dietary conditions, consist in a diminution in the amount of calcium salts deposited, followed by a change in the type of calcification from a homogeneous to an irregular globular type and the continued formation of dentinoid matrix. Atrophy of the odontoblasts appears after about 14 days, presumably when all of the cellular vitamin D is utilized. It is thought that the odontoblasts are chiefly responsible for the formation of dentin. Because of the similarity in function of odontoblasts and osteoblasts, it is suggested that the changes in the bones in rickets are probably due to a primary involvement of the osteoblasts.

**Nutritional muscular dystrophy in the guinea pig and rabbit, M. Goettsch and A. M. Pappenheimer** (*Jour. Expt. Med., 54 (1931), No. 2, pp. 145–165, pls. 2, figs. 5*).—A continuation of the investigation noted previously from a preliminary report (E. S. R., 63, p. 291) has led to the conclusion that the nutritional muscular dystrophy originally described as probably due to a deficiency in vitamin E must be caused by lack of some unidentified factor, since the addition of vitamin E does not prevent the development of the pathological condition, and inanition, infection, and scurvy have also been ruled out. Guinea pigs and rabbits are susceptible and rats resistant. The pathological changes, which are definitely restricted to the striated muscles, are described in their gross and microscopic appearances. No significant alterations were found in the central nervous system or the larger peripheral nerve trunks.

**Nerve endings in nutritional muscular dystrophy in guinea pigs,** W. M. Rogers, A. M. Pappenheimer, and M. Goettsch (*Jour. Expt. Med., 54 (1931), No. 2, pp. 167–169, pls. 2*).—Supplementing the investigation noted above, the authors have examined the muscle nerve endings of animals suffering from the nutritional muscular dystrophy and have found them not to be visibly altered.

**The relationship of disorders of the digestive tract to anemia,** W. B. Castle, C. W. Heath, M. B. Strauss, and W. C. Townsend (*Jour. Amer. Med. Assoc., 97 (1931), No. 13, pp. 904–907*).—The authors report clinical data substantiating the hypothesis that "pernicious anemia is a deficiency disease resulting not from a direct inadequacy of the diet but from a conditioned deficiency produced by the failure of some function of the normal stomach to take place in the stomach of the patient with pernicious anemia. This reaction, in normal individuals, we believe has to do with the manipulation of protein and leads to the absorption of a factor necessary for the maintenance of normal bone marrow activity."

The clinical evidence consisted chiefly in the demonstration that neither lean beef nor the fasting gastric juice of a normal human being was in the slightest degree effective in the treatment of pernicious anemia, but that the same amount of beef recovered from the normal human stomach, or incubated in normal gastric juice, produced remissions comparable to those obtained with liver in moderate doses. The factor responsible for this effect could not be demonstrated in normal human saliva, in normal human duodenal contents free from gastric juice, or in any portion of the gastrointestinal tract of patients with pernicious anemia. It is thought to be a protein or closely related substance. Its activity is destroyed by boiling for 5 minutes, or heating for one-half hour at from 70 to 80° C., or for 3 days at 40°. Normal human gastric juice retains its effectiveness in neutral solution and when freed from pepsin and rennin by adsorption methods. Lipase is considered of no significance in the reaction, and commercial pepsin, rennin, and erepsin are without effect.

## TEXTILES AND CLOTHING

**The determination of sample size for diameter measurements in cotton fiber studies,** O. A. Pope (*Jour. Agr. Research [U. S.], 43 (1931), No. 11, pp. 957–984, figs. 11*).—The determination of the smallest number of individual cotton fiber diameter measurements that would constitute a statistically reliable sample was sought for at the Arkansas Experiment Station. An intimate relationship exists between fiber diameter dimensions and the spinning and manufacturing value of cotton. The measurement of mean diameter $\frac{W+T}{2}$ suggested by Barritt (E. S. R., 61, p. 897) seemed the most practical of methods for measuring fineness from the viewpoint of giving a measure of the normal collapsed fiber. The diameter dimension ratio $\frac{W}{T}$ is proposed as a measure of the relative fiber wall thickness among different varieties and strains. In these formulas the width ($W$) is taken at the widest part of the convolution as it appears in flat view under the microscope, and the thickness (*T*) is the measurement of the edge-on position of the fiber.

Consideration of all of the distributions of the fiber dimensional constants suggested that diameter measurements may safely be regarded as normal distributions in so far as statistical treatment is concerned. The frequency distributions for the diameter dimension ratio showed a greater range in Rowden 3003 than in either New Boykin 1235 or Lightning Express No. 7. This may be due to a lack of physiological balance caused by selection for staple length while retaining the genetic diameter of a coarse, short-staple cotton. Significant errors evidently were not introduced by the rounding off used in the conversion table or by the size of class selected in constructing the frequency distributions, and the technic used in measuring was such that a fairly good random distribution of values was obtained. A formula presented determines the size of sample for which differences will be statistically significant within a given range of accuracy.

A sample size of 100 measurements of width and thickness, according to evidence obtained in this experiment, will provide a safe margin of statistical significance for the determination of differences on the basis of a ±0.5μ range, as well as a range of 2.5 per cent of the mean. The measurements showed Rowden 3003 and New Boykin 1235 to be similar in fineness, although differing considerably in staple length. Differences of considerable magnitude were found between these strains and Lightning Express No. 7.

**The bactericidal effectiveness of home laundering methods for silk and rayon,** E. H. Roberts (*Washington Col. Sta. Bul. 260 (1931), p. 37*).—The method adopted as corresponding to current practice in laundering silk and rayon undergarments consisted in washing the garment in a bowl of lukewarm suds of a mild soap, rinsing once or twice, and drying indoors. To determine the bactericidal effectiveness of such a process, sterile rayon undergarments were inoculated with the colon bacillus and laundered, with bacteriological tests in various stages of the process. In the single series of tests reported, washing eliminated only 30 to 50 per cent of the bacteria, but after drying either indoors or out the bacterial count was reduced to less than 1 per cent of the original count.

## MISCELLANEOUS

**New Jersey's Agricultural Experiment Station, 1880–1930,** C. R. Woodward and I. N. Waller (*New Jersey Sta., 1932, pp. [3]+645, pl. 1, figs. 224*).—This history is reviewed editorially on page 706.

**Forty-fourth Annual Report [of Georgia Station], 1931,** H. P. Stuckey (*Georgia Sta. Rpt. 1931, pp. 54, pls. 4, figs. 12*).—This contains the organization list, a report by the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1931. The experimental work reported is for the most part abstracted elsewhere in this issue.

**Forty-fourth Annual Report [of Mississippi Station], 1931,** W. R. Perkins et al. (*Mississippi Sta. Rpt. 1931, pp. 80*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1931, and departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue.

**Forty-first Annual Report [of Washington College Station], 1931,** E. C. Johnson et al. (*Washington Col. Sta. Bul. 260 (1931), pp. 84*).—This contains the organization list, a report on the work of the station, and a financial statement for the fiscal year ended June 30, 1931. The experimental work reported is for the most part abstracted elsewhere in this issue.

# NOTES

**Massachusetts College.**—Announcement is made that the Northeastern Forest Experiment Station, which has had its headquarters at the college under a cooperative agreement since its establishment in 1923, has been removed to New Haven, where close contact will be maintained with the Yale University Forest School and the Connecticut State Station.

**Nebraska University.**—Alva A. Baer, associate professor of agricultural engineering since 1920 and previously instructor in woodwork, adjunct professor, and assistant professor, died February 23 at the age of 64 years.

**Nevada Station.**—An economic survey in Lincoln and Clark Counties in the southern part of the State has been begun. The preliminary work will be in the nature of land utilization studies, which are to be followed later by more detailed studies in farm management.

**New Jersey Stations.**—Glenn Willard Burton and Joseph Ettinger have been appointed research assistants in agronomy.

**New York State Station.**—A useful laboratory method for studying the development of color in fruit has been worked out, using a 1,500-w. electric lamp with a suitable reflector. Upon continuous exposure for 4 or 5 days to this lamp, McIntosh apples that had showed no red became almost completely colored. The first traces of color began to appear after 60 to 70 hours' exposure, and development continued for about 3 days more, after which no further increase was detectable. Apples held in cellar storage at 45° F. for 3 months also responded to the electric light treatment, although they did not become as intensely colored as apples treated soon after picking.

**Wisconsin University.**—According to a note in *Wisconsin Country Magazine*, Dr. C. R. Strange has resigned as extension instructor in veterinary science to accept a position with the State Department of Agriculture and Markets and has been succeeded by E. R. Carlson. S. A. Wilde has been appointed research assistant in soils.

**Association of Land-Grant Colleges and Universities.**—The forty-sixth annual convention of this association is to be held in Washington, D. C., from November 14 to 16, 1932.

**Necrology.**—Dr. C. Dwight Marsh, widely known for his investigations of poisonous plants and other subjects, died in Washington, D. C., on April 23. Dr. Marsh was born in Hadley, Mass., December 20, 1855, and received from Amherst College the A. B. degree in 1877, the M. A. degree in 1880, and the D. Sc. degree in 1927, as well as the Ph. D. degree from the University of Chicago in 1904. From 1883 to 1904 he had served as professor of chemistry and biology and dean of the faculty of Ripon College and for the year following as professor of biology in Earlham College. Coming to the U. S. Department of Agriculture in 1905 as physiologist in charge of field investigations in poisonous plants in the Bureau of Plant Industry, he was transferred to the Bureau of Animal Industry in 1915 and continued his investigations there until his retirement in 1930.

William W. Ashe, connected with the U. S. D. A. Forest Service since 1905 and for several years senior forest inspector for the eastern national forest region, died in Washington, D. C., on March 18 at the age of 55 years. He was a leading authority on the forest types of the Southeast and a voluminous writer on the forest trees of the region. In the words of a recent tribute, he "was a pioneer of forestry science in the United States. . . . He was one of the first to recognize the need of forest research and to stimulate its initiation, and became himself an authority on logging costs, erosion, and forest economics."

The recent death in France is noted of Clifford Richardson, a pioneer chemist in the U. S. Department of Agriculture and said to be the last surviving member of the original membership of the Association of Official Agricultural Chemists. Mr. Richardson began his work in the Department in 1878, continuing in its service until 1887. He was the author of the first bulletin issued by the Division of Chemistry, The Composition of American Wheat and Corn, published in 1883, as well as of numerous other publications.

Sir Horace Plunkett, eminent for his pioneer studies of agricultural cooperation and rural life, died March 26, aged 77 years. His interest in agricultural cooperation dated from 1889. He founded the Irish Agricultural Organization Society in 1894 and subsequently created and endowed the Horace Plunkett Foundation for the promotion of agricultural development. From 1899 to 1907 he served as vice president of the Department of Agriculture and Technical Instruction for Ireland. Among his numerous publications was The Rural Life Problem of the United States, issued in 1910.

**New Journals.**—*Journal of Cellular and Comparative Physiology* is being published bimonthly by the Wistar Institute of Anatomy and Biology at Philadelphia, as "a medium for the publication of papers which embody the results of original research of a quantitative or analytical nature in general and comparative physiology, including both their physical and chemical aspects. . . . Preference will be given to analyses of fundamental physiological phenomena whether the material is vertebrate or invertebrate, plant or animal." The initial number contains nine articles, one of which is A Simple Method for the Quantitative Measurement of Cell Permeability, by M. H. Jacobs and D. R. Stewart (pp. 71–82).

*Anales de Química y Farmacia* is being published bimonthly at Santiago, Chile. The initial number contains a biographical account of the late Carlos Ghigliotto Salas, professor of advanced analytical chemistry and toxicology in the School of Chemistry and Pharmacy; abstracts; and a number of brief articles, among them The Avidity of Antitoxin and Its Significance in the Curative Value of the Serum, by R. Kraus (pp. 13–18); The Iodine Content of the Thyroid Gland in Chilean Cattle, by B. Blanco M. (pp. 19–25); Chemical Considerations in the Study of Specific Immunity Phenomena, by R. Palacios (pp. 26–34); and Oxalemia, by R. Valenzuela Saez (pp. 36–39).

*The Maryland Fruit Grower* is being published monthly by the Maryland State Horticultural Society at College Park, Md., as a successor to the *Fruit Growers News Letter*. It is planned to include in each issue one or more recent papers on timely orchard topics, and those in the initial issue are The Importance of Organic Matter in Orcharding, by E. C. Auchter, and Factors Influencing Yield, Size, and Quality of Apples, by J. R. Magness.

*Physics*, a journal of general and applied physics, is being published monthly at Menasha, Wis., by the American Physical Society. The initial number contains an article on Capillary Rise in Sands of Uniform Spherical Grains, by W. O. Smith, P. D. Foote, and P. F. Busang (pp. 18–26).

# EXPERIMENT STATION RECORD

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## RECENT WORK IN AGRICULTURAL SCIENCE

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**The non-volatile organic acids of green tobacco leaves,** H. B. VICKERY and G. W. PUCHER (*Jour. Biol. Chem., 90 (1931), No. 3, pp. 637–653*).—The authors of this contribution from the Connecticut State Experiment Station report the development of modified methods for the determination of the organic acids contained in plant tissues by means of which positive identification and approximately quantitative determination of the predominating acids can be secured. The most important modification consisted in the initial precipitation of the organic acids as barium salts in the presence of dilute alcohol. This method was quantitative with respect to the better known organic acids and was superior in many respects, particularly in convenience, to the customary precipitation of the lead salts by basic lead acetate.

These methods were applied to the determination of the acids present in extracts of the seeds of the tobacco plant, of the leaves of young and of mature plants, and of leaves that had undergone the commercial curing process, with the result of showing that only about half the total titratable acidity of tobacco-leaf extracts consists of acids of familiar types such as malic, citric, oxalic, succinic, and fumaric acids. The rest were acidic substances, part of which appeared to be phenolic acids, of which the nature has not yet been determined. "It is further evident that, in view of the presence of these substances, indirect methods for the determination of oxalic, citric, and malic acids . . . do not yield trustworthy results."

**Cobalt in plant ash,** E. R. BISHOP and M. LAWRENZ (*Science, 75 (1932), No. 1940, pp. 264, 265*).—In this note from the Alabama Experiment Station, attention is called to variations observed in the color of the ash of different vegetables which were being ashed for the calcium determinations noted on page 889. Of the plants grown at the station, New Zealand spinach and chard gave an intense green ash, tendergreen and Chinese cabbage a medium green ash, and turnips from green to brown. Cabbage grown in the greenhouse on three different soils gave a green ash of varying intensities and on a fourth soil a white ash. Turnips similarly grown on still another type of soil gave a pale green ash.

To determine the cause of the green color thus noted, the hydrochloric acid solutions of the ash of several samples of vegetables were examined in the Allison apparatus[1] for chlorides of iron, chromium, manganese, cobalt, nickel, and copper, with the conclusion that the color was due to the presence of cobalt. No relation was observed between plant growth and the presence or absence of cobalt in the ash.

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[1] Jour. Amer. Chem. Soc., 52 (1930), No. 10, pp. 3796–3806, fig. 1.

**Fermentation and crystallization of honey, E. J. Dyce** (*New York Cornell Sta. Bul. 528 (1931), pp. 76, fig. 1*).—The treatment of honey prior to packing and the effect of various methods of packaging with respect both to fermentation and crystallization were given detailed experimental study with a view to eliminating the fermentation and insuring the formation of fine crystals. Among the observations recorded were an injury to quality when the heating, required to destroy yeasts, reached too high a temperature or was followed by slow cooling; an improvement in crystallization by rapid cooling, agitation, and the introduction of a small quantity of starter consisting of already well crystallized honey; and a superior keeping quality in samples either hermetically sealed or vacuum sealed as compared with samples packed either in glass containers or in friction-top tins.

"After the honey has been granulated by the process described, it can be removed from the constant temperature to which it has been subjected and may then be kept at ordinary room temperature without fermentation or liquefying."

**The action of reducing sugars on organic nitro compounds, C. F. Poe and F. G. Edson** (*Colo. Univ. Bul. 303 (1931), pp. 201–204*).—The color change, if any, effected in the case of each of 92 organic nitro compounds by the reducing action in alkaline solution of the four sugars dextrose, lactose, levulose, and maltose was recorded, with the object of finding, if possible, a compound reducible, with distinguishing color development, by levulose but not by other reducing sugars. Of each nitro compound 0.7 gm. was dissolved in 100 cc. of 4 per cent sodium hydroxide solution. The sugar solutions were made up to contain 1 mg. per cubic centimeter. In a Folin sugar tube, 1 cc. of the sugar solution was treated with 3 cc. of the alkaline solution of the nitro compound, and the tube was heated for 15 minutes in boiling water to insure the completion of any reduction which might take place. After cooling for three minutes in running water, the reaction mixture was in each case made up to the 25 cc. mark of the tube, and the color was compared with that of a control in which the nitro compound had been treated in the same way, except that no sugar was added.

None of the reactions observed were found specific for levulose; but eight compounds "gave a characteristic color change . . . which did not fade or change color on standing. These compounds show promise as an ingredient of a reagent which might be used for the quantitative determination of reducing sugars." Of these substances there were five of which the color reaction with reducing sugars was not found previously to have been recorded, viz, 3,4-dinitrobenzoic acid, meta-dinitrobenzoyleneurea, 3.5-dinitro-ortho-cresol, 2,4-dinitrophenol, and 2,6-dinitrophenol.

**The effect of potassium cyanide upon the amylase activity of potato juice, F. E. Denny** (*Contrib. Boyce Thompson Inst., 3 (1931), No. 2, pp. 297–307*).—At approximately pH 6.2, 30 mg. of potassium cyanide in 100 cc. of the reaction mixture caused an increase of from 50 to 100 per cent in the amylase activity of the juice of potato (*Solanum tuberosum*) tubers. The effect of the cyanide decreased as the reaction of the solution was brought nearer neutrality. Potassium cyanide added to potato amylase, prepared by dialyzing the juice in collodion bags for 24 hours, affected the amylase activity only very slightly, however. Further, "when the juice was dialyzed for various time periods up to 24 hours before the addition of potassium cyanide, the gains in amylase activity due to the addition of potassium cyanide became progressively smaller.

In order that the activating effect of potassium cyanide can become evident, not only must the amylase and the potassium cyanide be present, but also a portion of the juice which will pass through collodion in dialysis. Evidence was obtained indicating that the fraction of the potato juice whose presence is necessary for the activating effect of potassium cyanide upon amylase diffuses through collodion at a rate that is slower than that for reducing sugars."

**A low-temperature thermostat,** H. W. Foote and G. Akerlof (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 4, pp. 389, 390, figs. 2*).—This note indicates the essential features of a bath in which a low temperature is maintained by means of a small electric refrigerating unit and controlled by a toluene-mercury thermostat, if necessary, within the variation ±0.015° C. The tank has a capacity of about 450 liters. A wiring diagram and an outline sketch of the complete assembly accompany the note.

**Improved gauze-plate laboratory rectifying column,** S. Palkin (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 4, pp. 377, 378, figs. 4*).—An improved gauze-plate column, which possesses the advantages of simplicity of construction and resistance to flooding and has been found particularly well adapted for vacuum fractionation, is described in a contribution from the U. S. D. A. Bureau of Chemistry and Soils. A drawing gives details and dimensions.

**A statistical study of some sampling relations with special reference to quantitative microscopy,** J. D. Wildman (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 4, pp. 563–570, figs. 2*).—Some phases of sampling theory are discussed and illustrated by microscopic counts of known mixtures of lycopodium spores with starch grains, paper fiber counts, etc.

"From the results of the experiments and the known fundamental relations . . . it is obvious that the size of the sample error in microscopic methods of the type herein described is no greater than in macroscopic methods of the same type, and that there is no more reason for rejecting the results of microscopic examinations on the basis of sample error than there is of rejecting the results of the examination of much larger units. Moreover, the value of the resulting analysis in either case is greatly enhanced by a knowledge of the sample error present."

**A magneto-optic method of chemical analysis,** F. Allison and E. J. Murphy (*Jour. Amer. Chem. Soc., 52 (1930), No. 10, pp. 3796–3806, fig. 1*).—In the magneto-optically polarimetric system employed each compound studied produced its own characteristic minimum, or minima, of light, regardless of the presence of other compounds. The characteristic minima of those compounds for which quantitative tests were made did not disappear until the concentration had been reduced to about one part of the compound in $10^{11}$ parts of water.

These minima appeared at points along the scale in the order of the chemical equivalents of the metallic elements of the compounds, "or the differential time lag is some inverse function of the chemical equivalent." The number of characteristic minima, with few exceptions, was found equal to the number of known isotopes of the metallic element of the compound.

**Improved technic for microgravimetric analyses,** P. L. Kirk and R. Craig (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 4, pp. 345–347, fig. 1*).—The apparatus described in this contribution from the University of California Medical School consists essentially of a reaction vessel made from a test tube sealed at the bottom to a heavier and tapering tube. The outside of the taper is ground into the top of a small filter tube, while the inside of the taper is stoppered by a ground-glass rod, hooked at its upper end to permit its withdrawal by means of a second hook rod. The filter tube is fitted with a 0.005 in. platinum foil filter plate punctured with several punched holes 0.5 mm. or less in diameter and sealed into the walls of the filter tube. The necessary filter pad is to be made from well-washed, finely ground asbestos; and for the sealing of the ground stopper rod, glycerol was found satisfactory. Grease was found not desirable. A diagram accompanies the description of the assembly.

The technic for the use of this apparatus is given in working detail. Such determinations as those of sulfate, phosphate, or halide could be made on a very small sample.

**A rapid colorimetric method for the determination of potassium by the use of cobaltinitrite** (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 4, pp. 573–577*).—The author of this communication from the Kentucky Experiment Station found that by measuring colorimetrically the change in strength of the precipitating reagent, instead of making quantitative separations of the precipitate, the time required to make the determination was greatly shortened. The working conditions are prescribed in detail.

**Method for determination of fluorine in phosphate rock and phosphatic slags**, D. S. Reynolds and K. D. Jacob (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 4, pp. 366–370*).—The fluorine in highly phosphatic, calcareous materials, such as phosphate rock, can not, according to the authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils, be made water-soluble by a single fusion with alkaline fluxes. Three fusions were found usually to fail of converting more than about 90 per cent of the fluorine into the water-soluble condition. The failure of alkaline fusions to effect complete decomposition of such materials is attributed to the setting up of equilibrium reactions involving insoluble fluorphosphates of the fluorapatite type.

The method described involves a single fusion of the sample with sodium carbonate and silica, followed by extraction of the water-insoluble residue with dilute nitric acid. After removal of the dissolved calcium and phosphoric acid, the fluorine was determined by the lead chlorofluoride method. The method gave satisfactory results on fluorine-bearing phosphatic slags and on the domestic types of phosphate rock with the exception of Tennessee blue-rock phosphate, which was found to contain pyrite and gypsum in quantities sufficient to interfere with the determination. Comparative results for fluorine in various phosphatic materials, as determined by this method and by the volatilization method, are given.

**Effect of certain forms of silica on determination of fluorine by volatilization method**, D. S. Reynolds and K. D. Jacob (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 4, pp. 371–373*).—Silica gel which had not been ignited at temperatures above 1000° C., and silicates decomposable by sulfuric acid were found by the authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils to have under certain conditions a very deleterious effect on the determination of fluorine by the volatilization method. This appeared to result from the formation of a nonvolatile silicon oxyfluoride, probably $SiOF_2$. Silica gel which had been ignited at 1100° C. or higher temperatures was as effective as quartz as a source of silica for the determination. The volatilization method did not give reliable results for fluorine either in slags or in certain natural phosphates containing acid-decomposable silicates.

**Volumetric and gravimetric determination of mercury as periodate**, H. H. Willard and J. J. Thompson (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 4, pp. 398, 399*).—The authors of this contribution from the University of Michigan report an investigation of which the results showed that mercury may be quantitatively precipitated as mercuric periodate, $Hg_5(IO_6)_2$, from 0.15 N nitric or 0.1 N sulfuric acid solution. It could be weighed in this form, or determined volumetrically by iodometric methods. Moderate amounts of aluminum, cadmium, zinc, copper, nickel, calcium, and magnesium did not interfere.

In the case of samples containing from about 0.05 to about 0.63 gm. of mercury the error ranged from +0.3 mg. to —0.3 mg., nitric and sulfuric acids being present. In the presence of hydrochloric acid, however, precipitation was very far from complete. It is noted that if a chloride solution is to be analyzed, the mercury may first be precipitated as metal or sulfide and then converted into nitrate or sulfate.

Of the two methods for the volumetric determination of the periodate content of the precipitate, the first depends on the reaction of periodates with potassium iodide to liberate elementary iodine, which is titrated with thiosulfate. In the second, treatment of the periodate with excess of standard arsenite solution is followed by titration of the excess with 0.1 N potassium iodate.

**Suggestions concerning the analysis of potash fish oil soap used for emulsification,** A. W. Cressman, H. H. Bliss, and A. J. Haas, jr. (*Jour. Econ. Ent., 24 (1931), No. 6, pp. 1252–1255*).—A modified form of reporting analyses of fish oil soap to give the characters important in emulsification is suggested.

**Method for the estimation of enzyme yield in fungus cultures,** Z. I. Kertesz (*Jour. Biol. Chem., 90 (1931), No. 1, pp. 15–23*).—A contribution from the New York State Experiment Station, this paper presents a new method for the determination of the enzyme yield of mold cultures and for obtaining comparable enzyme determinations on solid and liquid materials. As an example, the method is applied to the saccharase of *Penicillium glaucum*, and data presented are designed to show the significance and suitability of the method.

It is shown that the total enzyme content of the mycelium of a mold culture may be expressed by the formula

$$E_1=\frac{k\times\text{gm. of sucrose}}{\text{dry matter}}\times(\text{total dry matter yield of the culture in grams})$$

in which *k* is the monomolecular reaction constant, sucrose is the total sucrose content of the reaction mixture in grams, and dry matter the amount of grams of the dry mycelium which supplied the enzyme used.

"In the same way the total saccharase content of the medium can also be expressed. But in this case the calculation is made on the basis of volume rather than weights.

$$E_2=\frac{k\times\text{gm. of sucrose}}{\text{cc. of medium used}}\times(\text{volume of entire culture medium in cubic centimeters}).$$

By adding these two values ($E_1+E_2$) a number is obtained which indicates the saccharase, or other enzyme, yield of the whole culture. . . . The proposed method is applicable to the estimation of other enzymes in fungal or bacterial cultures, since the same principles apply to the determinations of other enzymes as well." The results of applying this method in the interpretation of the behavior of *P. glaucum* cultures developing under various conditions are indicated.

**A source of error in the determination of amide nitrogen in plant extracts,** H. B. Vickery and G. W. Pucher (*Jour. Biol. Chem., 90 (1931), No. 1, pp. 179–188*).—This contribution from the Connecticut State Experiment Station notes that with respect to previously recorded work, "there is little agreement . . . as to the exact conditions under which this hydrolysis should be conducted." The new experimental evidence showed that widely varying results are secured for the total ammonia nitrogen of fresh tobacco leaf extracts after hydrolysis, according to the concentration of the hydrolyzing acid chosen. "This variability has been shown to be due to the use of hydrochloric acid in the presence of the nitrate that is a normal constituent of tobacco leaf extract. Fresh tobacco leaf appears to contain an easily oxidized substance which promotes the reduction of nitric acid to ammonia in the presence of excess of hydrochloric acid. . . . No evidence has been secured of the identity of this unknown substance but its behavior can be simulated by capryl alcohol."

It was also shown that the ammonia produced in the hydrolysis with hydrochloric acid is subject to more or less of direct oxidation by the mixture of hydrochloric acid and nitric acid formed when the former acid is used for the hydrolysis. "It so happens that, under the conditions of hydrolysis generally known as the Sachsse method these two factors [oxidation of ammonia and reduction of nitrates] approximately compensate each other, and asparagine added to a nitrate-containing plant extract can be satisfactorily recovered provided that definite conditions of hydrolysis are rigidly maintained. The results of this paper do not, therefore, necessarily cast doubt upon the accuracy of published data for the amide content of plant tissues that likewise contain nitrates. It is suggested, however, that the use of hydrochloric acid for amide hydrolysis under these conditions should be abandoned and that sulfuric acid be substituted," the data presented showing that "considerable latitude both in the concentration of the acid and the time of hydrolysis is then permissible."

**The determination of plant ash constituents in the presence of silica,** J. Davidson (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 4, pp. 551–558*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils found, in determinations of total and acid-soluble ash, silica, phosphorus, potassium, calcium, magnesium, iron, aluminum, and manganese in the straw of wheat and rice grown with and without fertilizer treatment, that when the ash was taken up in dilute hydrochloric acid without previous volatilization of the silica the results were in every case too low. When, however, the acid-insoluble residue was digested with hydrofluoric and sulfuric acids, larger quantities of the ash constituents were determined.

"Volatilization of silica or possibly other procedures to prevent retention of bases by the acid-insoluble residue is essential to the proper analysis of ash constituents of plant substances rich in silica. It is recommended that the acid-soluble ash in plant substances rich in silica be determined, as well as the total ash when analyses of the ash constituents are omitted."

**The determination of manganese in plant materials by the periodate method,** J. Davidson and R. G. Capen (*Jour. Assoc. Off. Agr. Chem., 12 (1929), No. 3, pp. 310, 311*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils describe a modification of the method of Willard and Greathouse (E. S. R., 38, p. 204)

Ash the plant materials in platinum dishes in an electric muffle. Add 5 cc. of phosphoric acid and 20 cc. of distilled water to each dish. Heat the dishes on a steam bath for a few minutes and wash the contents into beakers. Heat the solutions to boiling and keep at this temperature after the addition of 0.3 gm. of potassium periodate until the full development of the permanganate color occurs. With the use of phosphoric acid as above prescribed, the development of the full color required but from 2 to 3 minutes after the solutions reached the boiling point. Sulfuric acid gave a less rapid color development, nitric acid still less.

**Colorimetric methods for the determination of manganese in plant materials,** J. Davidson and R. G. Capen (*Jour. Assoc. Off. Agr. Chem., 14*

*(1931), No. 4, pp. 547–551)*.—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils determined manganese colorimetrically both in inorganic manganese compounds and in plant materials. The potassium periodate and the ammonium sulfate methods were found equally suitable for plant materials, while the sodium bismuthate method yielded results appreciably lower, and the gravimetric method was inaccurate.

**Volumetric determination of manganese after oxidation by periodate,** H. H. WILLARD and J. J. THOMPSON (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 4, pp. 399–401*).—The authors of this contribution from the University of Michigan showed that manganese in quantities up to 30 mg. could be determined by oxidizing the element to the permanganic condition with sodium metaperiodate ($NaIO_4$), and titrating the permanganate with standard ferrous sulfate after removal of the excess periodate by precipitation as the mercuric salt. The initial oxidation reaction could be carried out either in sulfuric or in phosphoric acid solution, but was most satisfactorily conducted in the last-named acid, "in which case less than a milligram of chromium does not interfere." Chlorides and compounds of cobalt and of cerium were found to interfere.

**A modification of the Hagedorn-Jensen method for semi-macro quantities of glucose,** G. A. SCHRADER (*Alabama Sta. Rpt., 1931, pp. 39–42, fig. 1*).—The procedure of which the details of a modified form are here given depends upon the oxidation of the glucose by potassium ferricyanide, precipitation of the resulting ferrocyanide as the double potassium zinc salt, and the determination of the unreduced excess of ferricyanide by adding potassium iodide and titrating the liberated iodine with sodium thiosulfate standard solution. For the last error, it was found desirable to use samples containing not less than two nor more than 5 mg. of glucose. A graph from which the glucose in milligrams may be read off from the cubic centimeters of 0.02 N sodium thiosulfate solution used is given.

**Factors influencing the changes in oxidation-reduction potential on the reduction of methylene blue in milk,** A. C. FAY and G. A. AIKINS (*Jour. Agr. Research* [*U. S.*], *44 (1932), No. 1, pp. 71–83, figs. 6*).—The authors of this contribution from the Kansas Experiment Station find that the potential : time curves of milk with and without methylene blue remain in close agreement during the entire reduction process. The blue color and initial potentials of reduced samples could be restored by vigorous shaking or aspirating with air. Either of the above treatments also restored the initial potentials of samples without dye.

The zone of reduction became more positive with an increase in the percentage of fat and more negative with an increase in the concentration of dye. The time required for visible reduction increased as the zone of reduction became more negative. When excessive amounts of dye (1 : 10,000) were added, the potential of the solution did not pass smoothly to more negative limits, but was deterred as it approached the zone of reduction characteristic of this indicator. The addition of cane sugar to cream not only delayed the potential drift and reduction time of the dye, but affected the form of the potential : time curve as well.

The bacterial flora of a sample of market milk influences the form of the potential : time curve.

**Effect of light on the reduction of methylene blue in milk,** G. A. AIKINS and A. C. FAY (*Jour. Agr. Research* [*U. S.*], *44 (1932), No. 1, pp. 85–95, figs. 7*).—The potentials of cream, whole milk, and skim milk were found by the authors of this contribution from the Kansas Experiment Station to drift toward the negative side when these solutions were exposed to sunlight. Potential changes to both more positive and more negative values were deterred by the presence of fat. This effect of fat was especially noticeable when solutions were placed alternately in the sunlight and in the dark. The addition of fat to skim milk hastened the reduction of methylene blue in samples exposed to the sunlight, an effect probably due to the tendency of fat to raise the zone of reduction. Sodium oleate and sodium stearate also shortened the reduction time, but did so by causing a more rapid fall of potential.

The addition of methylene blue to skim milk or cream accentuated the potential changes induced by sunlight. With each increase up to 1:25,000 in the concentration of dye added to skim milk containing sodium oleate, the reducing intensities induced by sunlight were progressively more negative. Visible reduction of methylene blue induced either by sunlight or bacterial activity took place within the $E_h$ limits characteristic for the particular sample. It was observed that as the solution developed a progressively more negative potential the methylene blue decolorized whenever this potential passed through the zone of reduction characteristic of this dye. Similarly, the blue color reappeared when the solution developed a potential sufficiently positive to oxidize the dye present. When skim milk plus methylene blue which had been reduced by sunlight was placed in the dark, the potentials quickly became sufficiently positive to oxidize the dye. Artificial light hastened the reduction of methylene blue in market milk. Light from a 75-watt electric lamp induced a potential drift in milk which differed only in degree from that observed in the case of sunlight. The reduction of methylene blue in one sample of milk was hastened 2.5 hours by exposure to light from an electric bulb.

The reducing intensity induced by bacterial activity was more negative than that induced by sunlight. In the case of sunlight the negative limits reached were seldom below zero, as compared with a reducing intensity of —0.2 volt induced by bacteria.

**The use of copper and iron salts for the deproteinization of blood,** M. Somogyi (*Jour. Biol. Chem., 90 (1931), No. 3, pp. 725–729*).—Certain iron salts (preferably ferric sulfate) were capable of satisfactory use in place of colloidal hydrated iron oxide as precipitants for blood proteins in the preparation of samples for the determination of blood sugars. Copper salts were found preferable to iron salts for such use, however, and appeared fully to equal zinc salts in the speed and simplicity of the technic made possible by them. For the precipitation of plasma or serum proteins copper salts were superior to those of zinc.

**A rapid method for determining acid-soluble phosphoric acid in eggs,** J. Fitelson and I. A. Gaines, jr. (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 4, pp. 558–562*).—The method of Pine was modified in detail. A change was made in the extraction procedure, the manner of oxidizing the organic matter was altered to permit the substitution of a volumetric for Pine's gravimetric determination of the phosphate, and a volumetric procedure for this final step was worked out and tested. Full working directions for the proposed modified method are given.

**Detection of added lecithin in chocolate products,** W. O. Winkler and J. W. Sale (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 4, pp. 537–547*).—A procedure essentially the same as the tentative method for lecithin-phosphoric acid of the 1925 edition of the Methods of Analysis (E. S. R., 55, p. 11) was slightly modified in detail to adapt it to chocolate samples, and found superior to five other methods. It is stated that the quantities of lecithin commercially added to chocolate coatings can readily be detected and that, "contrary to representations made by certain chocolate manufacturers, no material change in the lecithin content was noted when cacao beans were roasted at temperatures and for periods of time corresponding to commercial practice."

**Esters as adulterants of cassia oil, and their detection,** J. Callaway, Jr., and T. N. Bennett (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 4, pp. 571–573*).—Certain esters likely to be present as adulterants in the volatile oil of *Cinnamomum cassia* were found detectable by hydrolysis with 10 per cent potassium hydroxide in absolute alcohol, in which reagent the organic acids involved formed heavy precipitates of their alcohol-insoluble potassium salts. In carrying out the test on a large number of crude oils the results were always negative, whereas in the presence of benzyl benzoate and certain other esters a positive test was always obtained.

**Determination of small quantities of sulfur and chlorine when present in turpentine,** W. C. Smith (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 4, pp. 354, 355*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils found that small quantities of sulfur and chlorine in turpentine could be determined quantitatively by using the Kennedy sulfur lamp with A. S. T. M. Method D–90–26T. Sulfur was found in all samples of refined sulfate wood turpentine tested, but chlorine in three samples only out of ten tested. The sulfur content of well-refined sulfate wood turpentine was so small as to escape detection by the usual qualitative methods. Ethyl mercaptan to give a sulfur content of 0.054 per cent was added to a sample of gum spirits of turpentine which had been shown to be free from sulfur, and the figure 0.052 per cent was obtained on applying the method of sulfur determination here described. An equally satisfactory determination of chlorine was also found possible.

## METEOROLOGY

**Dry climates of the United States.—II, Frequency of dry and desert years 1901–1920,** R. J. Russell (*Calif. Univ. Pubs. Geogr., 5 (1932), No. 5, pp. 245–274, pls. 2, figs. 3*).—This paper, supplementing one previously noted (E. S. R., 65, p. 315), presents "in numerical and cartographic form data concerning the frequency of the types of drought here called dry and desert years" in that part of the United States where the rainfall is less than 20 in., and briefly mentions certain salient correlations of rainfall with landscapes as was done in the previous paper. More detailed consideration of the significance of the results is reserved for future papers. The study is based on U. S. Weather Bureau summaries of climatological data and represents "a new application of the Köppen system of climatology."

**The influence of climate on Washington agriculture,** E. C. Johnson (*Northwest Sci., 6 (1932), No. 1, pp. 17–24*).—Attention is called particularly to the climatic contrasts of eastern and western Washington. "Broadly speaking, Washington may be said to fall within two climatic zones, one west of the Cascades, tempered by the ocean and characterized by a high humidity, abundant precipitation during the fall, winter, and spring, and a comparatively small variation in temperature, and another east of the Cascades with less rainfall and greater extremes in temperature." The determining effect of climate on crop and livestock production and farm management in the two regions is especially emphasized.

**Some phases of fruit-frost work in southern Alabama,** E. S. Nichols (*Bul. Amer. Met. Soc., 13 (1932), No. 2, pp. 21–24*).—An account is given of studies in the Satsuma orange-growing region of southern Alabama, with special reference to frost damage, prediction, and protection. It was observed during the winter of 1929–30 that "severe damage did not result unless the temperature fell below 20°; at and above that point, beginning probably at about 22°, only slight defoliation and damage to tender shoots appear to have resulted. But with fall below 20° damage increased decidedly with each degree; the occurrence of 15° being serious. Specially severe damage was noted in cases of weak trees, those scale-infested, and those recently sprayed with unrefined oils." "Banking," or heaping earth about the bases of the trees, afforded some protection. Some observations on the use of orchard heaters were made, and growers are advised to "use fruit temperatures rather than air temperatures in determining when to light heaters."

**Pyrheliometers and pyrheliometric measurements,** H. H. Kimball (*U. S. Dept. Agr., Weather Bur. Circ. Q (1931), pp. III+28, figs. 16*).—Recognizing the importance of measuring the intensity as well as the duration of solar radiation, this circular describes various pyrheliometers and auxiliary apparatus used for such measurement, with instructions for their care and for the reduction and use of the records. Continuous records of the duration of sunshine have been made at first-class Weather Bureau stations for many years.

**Climatological data for the United States by sections, [September-October, 1931]** (*U. S. Dept. Agr., Weather Bur. Climat. Data, 18 (1931), Nos. 9, pp. [205], pls. 2, figs. 6; 10, pp. [205], pls. 3, figs. 4*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1931.

**Meteorological observations, [January-February, 1932],** C. I. Gunness and K. M. Wheeler (*Massachusetts Sta. Met. Ser. Buls. 517–518 (1932), pp. 4 each*).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

## SOILS—FERTILIZERS

**The soil: An introduction to the scientific study of the growth of crops,** A. D. Hall (*London: John Murray, 1931, 4. ed., rev. and enl., pp. XVII+388, pls. 4, figs. 14*).—In this revised and enlarged edition, advance in soil science since the publication of the third edition of the book in 1920 (E. S. R., 43, p. 621) is recognized in the rewriting of parts of the old text and the addition of much new material, especially with regard to the formation of different types of soil in response to climate, soil profiles, soil colloids in their relation to soil properties and behavior under different treatments, mechanical analysis, and other directions in which great progress has been made in recent years. The purpose of the book is stated to be "to present the student with an account of the soil which will give him a sound general conception of the scientific aspects of the soil as it is regarded to-day, a conception into which the current developments of knowledge will fit." The subject is considered primarily from the point of view of agriculture, and those features of soil science (pedology) which have no necessary connection with agriculture are dealt with only as they "may be of service to the scientific man who is called upon to advise the cultivator."

**Studies on the dispersion procedure used in the hydrometer method for making mechanical analysis of soils,** G. J. Bouyoucos (*Soil Sci., 33 (1932), No. 1, pp. 21–26*).—The author found 10 minutes' stirring with his own stirrer method of dispersion (E. S. R., 57, p. 710) to have as great an effectiveness as 16 hours of shaking with the standard shaker. Treatment with hydrogen peroxide affected the mechanical analysis of such soils only as contain large proportions of organic matter, especially undecomposed organic matter. Of the stirrer method it is noted, however, that "on account of its efficiency, the mechanical stirrer tends to break down the sand particles on long stirring; hence it is advisable not to stir the sandy soils too long."

It is concluded that "the extreme rapidity with which the hydrometer method is able to measure the mechanical analysis of soils is not due, therefore, to their incomplete dispersion. Further research and comparison tend to support the original findings that, for all practical purposes, the hydrometer method is reasonably accurate and reliable."

**A physico-chemical study of the Susquehanna fine sandy loam profile,** L. D. Baver and G. D. Scarseth (*Amer. Soil Survey Assoc. Bul. 12 (1931), pp. 7–11, pl. 1; abs. in Alabama Sta. Rpt. 1931, p. 6*).—The profile studied consisted of the four horizons (1) from surface to 6 in., brown, noncoherent, loamy fine sand, pH 4.9; (2) 6 to 22 in., red, friable, granular, moderately plastic clay, pH 4.7; (3) 22 to 44 in., mottled red and gray, granular plastic clay, pH 4.3; and (4) below 60 in., a grayish brown, compact, plastic clay having a structure "prismatic to platey." and a pH value of 4.1. This horizon is said to represent the unweathered parent material. Of this soil the authors take up the mechanical composition, acidity and base-exchange relationships, and the chemical composition of the colloidal material "The parent material from which this soil has developed is a very acid clay. There has been a removal of clay from the surface horizon with some deposition in horizons 2 and 3. The profile possesses A, B, and C horizons, although the B horizon is not well-developed. The strength of the soil acids has decreased with weathering. The acids on horizons 1 and 2 are more or less familiar. The colloidal material in each horizon has a very low degree of saturation with bases. The $SiO_2$-sesquioxide ratio of the colloidal material increases with depth to a maximum in the parent material. There has been a loss of $SiO_2$ and an increase in $Al_2O_3$, $Fe_2O_3$ and combined $H_2O$ in horizons 1 and 2. The data suggest that the lateritic type of weathering was predominant in the development of the profile."

**[Illinois soil reports]** (*Illinois Sta. Soil. Rpts. 50 (1932), pp. [2]+71, pls. 3, figs. 17; 51, pp. [2]+48, pls. 3, figs. 10*).—These reports continue the series previously noted (E. S. R., 65, p. 811).

No. 50. *Macoupin County soils*, E. A. Norton, R. S. Smith, E. E. DeTurk, F. C. Bauer, and L. H. Smith.—Located in southwestern Illinois, Macoupin County possesses an area of 543,840 acres, and is of a hilly topography, developed by erosion from a surface described as having been originally very smooth, and with drainage channels penetrating practically all sections of the area.

The soils of Macoupin County are classified into 29 color-texture types, of which a yellow-gray silt loam on compact medium-plastic clay leads in areal extent with 15.59 per cent of the county area. A grayish brown silt loam follows with 15.29 per cent, an eroded gravelly loam with 14.21 per cent, and a drabbish yellow-gray silt loam on compact medium-plastic clay with 12.76 per cent.

No. 51. *Fulton County soils*, R. S. Smith, E. E. DeTurk, F. C. Bauer, and L. H. Smith.—Fulton County occupies 556,006 acres in west-central Illinois, has a topography developed rather by erosion than by deposition, and is well drained.

Of 14 color-texture types an eroded silt loam is the most extensive, occupying 30.01 per cent of the total area. A brownish yellow-gray silt loam covers 27.3 per cent, a brown mixed loam 13.01 per cent, a brown silt loam 12.35 per cent, and a brown silt loam on clay 10.2 per cent.

**Proposed soil classification of the Island of Oahu, Hawaiian Islands, T. J. Dunnewald** (*Jour. Amer. Soc. Agron., 23 (1931), No. 12, pp. 977–983, fig. 1*).—This is a contribution from the University of Wyoming based upon personal observations and on soil samples collected by the author. A summary classification outline is given, together with brief descriptions of three profiles and condensed statements with respect to the topics of mechanical analyses, stages in weathering, chemical analyses, the lateritic process, the podsolic process, and bases.

The podsolic process, defined as "essentially leaching by organic matter," is considered to occur wherever tree growth covers the soil, or organic matter is deposited on the soil surface, even in tropical climates. It is further stated that "lateritic soils become podsolized when covered with trees. The podsolic process is slower or weaker at 20 to 30 in. of rainfall, more rapid at 100 in., and most active at 400 in."

The lateritic process is attributed principally to high temperature, but is considered to reach its maximum as a result of high temperature and rainfall combined. As a feature of this change, the quartz grains were found first to become coated with reddish iron compounds, then with black organic matter. A greater number of these coated grains, rather than any increase in the thickness of the coatings, appeared to characterize advanced stages. "The $SiO_2$ sesquioxides ratio of laterites becomes narrowest under combined high rainfall and high temperature. The ratio is larger under arid conditions and under high rainfall combined with cooler temperatures. Silica is retained less largely in the high lime-basic-arid laterites, and more so in the most arid, timbered, and most humid laterites of the higher elevations."

Iron hardpan did not appear, except that a slight tendency toward its formation was observed in the B horizon of a Fern Forest soil.

**Russian studies on soil profiles, J. S. Joffe** (*Jour. Amer. Soc. Agron., 24 (1932), No. 1, pp. 33–57*).—It is noted by the author of this contribution from the New Jersey Experiment Stations that the present paper is designed only "to outline the broad features of the Russian system of soil science so far as the soil profile is concerned. . . . The agronomic phase was not covered by the Russian literature of the earlier period, neither were the biological reactions and activities prominent in the soil profile studied by the biologist. In recent years both of these subjects have been attacked and some excellent work has been done."

**Further studies on the relationships between the fine material of soils and their physical characteristics, G. J. Bouyoucos** (*Soil Sci., 33 (1932), No. 1, pp. 27–39, pl. 1*).—This contribution from the Michigan Experiment Station reports experiments designed to ascertain whether or not there are close relationships between the "total colloids," clay, and fine clay of soils as determined by the hydrometer method, and such consistency properties of soils as the crumbling point, flowing point, and upper plastic limit, with a view to determining indirectly very quickly, simply, and probably more accurately by means of the hydrometer method the consistencies and other soil physical properties. Coefficients of correlation were calculated and reduced to the percentage basis.

"The coefficients of correlation on the soils worked show that the variability of the crumbling point is controlled 93.3 per cent by the total colloids, 88.93 per cent by the clay, and 85 per cent by the fine clay. The variability of the flowing point is controlled 84.8 per cent by the total colloids, 82.1 per cent by the clay, and 83.7 per cent by the fine clay. The variability of the upper plastic limit is controlled 83.9 per cent by the total colloids, 83.5 per cent by the clay, and 84.6 per cent by the fine clay. The variability of the moisture equivalent is influenced 82.7 per cent by the total colloids, 80.1 per cent by the clay, and 80.5 per cent by the fine clay.

"No definite relationship could be established between the chemical composition of the fine material of soils studied and their physical properties studied. Undoubtedly there may be some types or individual soils which will not show as good correlation between the fine material and physical characteristics as revealed in soils studied here. From the correlations obtained it would seem that the hydrometer method can be employed to obtain indirectly and quickly certain physical characteristics of soils."

**The laws of soil colloidal behavior.—VII, Proteins and proteinated complexes,** S. Mattson (*Soil Sci., 33 (1932), No. 1, pp. 41–72, figs. 6*).—The present paper continues a series of contributions on this subject (E. S. R., 66, p. 412) from the New Jersey Experiment Stations, dealing with the electrokinetic and chemical behavior of aluminum- and ferric-"proteinates" and of protein-"humates," "bentonates," and "silicates." The proteins studied include albumin, casein, edestin, and gelatin. The complex formation between the proteins on the one side and the positive and negative silver chloride and barium sulfate on the other was also studied and is here discussed.

"The fundamental principles previously established in the case of the silicated, phosphated, and humated compounds of the sesquioxides were found to apply to all the complexes herein described and have thus been generalized."

**Electrokinetics and base-exchange capacity of some inorganic colloids,** N. H. Parbery and S. Mattson (*Soil Sci., 33 (1932), No. 2, pp. 75–94*).—Experiments from the New Jersey Experiment Stations, more or less closely related to the investigations of Mattson (see above), are reported.

The introduction of the ferrocyanide ion in increasing amounts into the oxychloride of iron resulted in compounds whose isoelectric points are at low ranges.

Arsenious sulfide is strictly electronegative, and, formed under different conditions, its composition always closely approaches a stoichiometric relationship. Arsenic appeared too acidic to exist as a colloidal cation like the distinctly metallic elements. A series of isoelectric sulfides of tin in which the proportion of sulfide and base varied showed isoelectric points at lower pH values as the compounds became more saturated with sulfide sulfur. When sulfide was in excess of tin, as when ferrocyanide was in excess of iron, no isoelectric point for the compound was found to exist.

The isoelectric point of antimony oxychloride was comparatively low despite the high content of chlorine at the isoelectric point. This chlorine appeared to be but very slightly dissociated. All sulfides of antimony were electronegative. Bismuth oxychloride was found to represent the extreme condition among the metals considered, in that it had no isoelectric point but was electronegative over a wide pH range.

"The base-exchange capacity of the ferric ferrocyanides, at a pH where the higher ratio compounds did not decompose, was found to increase with the increasing ratio of the acidoid to the ampholytoid component. The same phenomenon was found in the sulfides of tin and antimony. Arsenious sulfide has a moderate exchange capacity at pH 7, that of the sulfides of bismuth being slight."

**Practical soil sterilization with special reference to glasshouse crops,** W. F. Bewley (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 22 (1931), pp. 23, pls. 3, figs. 4*).—This bulletin takes up the purpose of sterilization, some criteria of successful sterilization, sterilization by steaming, baking, and chemicals ("cresylic acid" and formaldehyde) and manurial treatment after steaming.

Of the results of soil sterilization it is stated that "sterilization enriches the soil by increasing the amount of nitrogenous foods. In rich soils the resulting crop tends to develop a soft type of growth; therefore withhold nitrogenous fertilizers and apply sulfate of potash and possibly some phosphate. Poor soils, however, react to nitrogenous fertilizers after steaming."

**[Soils and fertilizers]** (*Alabama Sta. Rpt. 1931, pp. 19–22*).—Earlier work is continued (E. S. R., 65, p. 415).

*Available phosphorus and greenhouse pot tests*, G. D. Scarseth.—No definite correlation was found between phosphoric anhydride content as determined by electrodialysis and plant growth in greenhouse pot tests. The phosphoric anhydride extracted by 0.002 N sulfuric acid and greenhouse pot test phosphorus growth on Black Belt soils supplied with nitrogen and potassium but not with phosphorus showed a correlation of 0.884. The presence of 30 parts in 2,000,000 of soil, as shown by the acid extraction method, was adequate for only about one-fourth normal growth of oats; 60 parts for only about one-half normal growth. Out of 22 soils tested, one soil only, containing over 100 lbs. per 2,000,000 lbs. of soil, produced normal growth without phosphatic fertilizer.

*The rate and degree of fixation of superphosphate by Black Belt soils*, G. D. Scarseth.—On three clays, 250 lbs. of superphosphate to the acre applied one year before planting was, even in the absence of added calcium carbonate, "practically lost to the plants." Also, "calcium carbonate applied at planting decreased the oat yield on cultures receiving a 250-lb. application of superphosphate but slightly increased the yield on cultures receiving 2,000 lbs. of superphosphate." On the other hand, "calcium carbonate applied one year before planting greatly increased the yields with all rates of superphosphate used."

*Buffer action and exchangeable ions in Black Belt soils*, G. D. Scarseth.—The results recorded confirm the opinion that for each stage of weathering the soil acids are similar in their characteristics. Average buffer capacities calculated according to Baver's equation (E. S. R., 65, p. 812), are given for eight soils of a common geological origin. Some base-exchange figures are also recorded.

*Phosphate studies in solution cultures*, A. L. Sommer.—The tests noted continue, with similar results, earlier work of Tidmore (E. S. R., 64, p. 315).

*Evidence of organic phosphorus compounds in the soil solution*, A. L. Sommer.—"Dialyzed soil extracts were examined [for $PO_4$] by the magneto-optic method [of Allison and Murphy (see page 803)]. Aliquots were treated with the following: $H_2O_2$, HCl, takadiastase, and emulsin, and were examined after being allowed to stand in contact with these reagents. . . . All reagents gave negative tests for $PO_4$." Each of the enzymes tested appeared to increase the inorganic phosphate content of the soil extract. Treatment with HCl had a like effect upon two of the three soils tested, $H_2O_2$ upon one of the three.

**The reciprocal effects of nitrogen, phosphorus, and potassium as related to the absorption of these elements by plants, W. Thomas** (*Soil Sci., 33 (1932), No. 1, pp. 1–20, figs. 5*).—In this contribution from Pennsylvania State College, an introductory section takes up the importance of understanding energy relations between soil and plant, a mathematical expression for evaluating the factors of fertility, the water content of the soil in relation to the maximum efficiency of mineral nutrients, the equation modified by the addition of fertilizers, the concept of physiological balance, nutrient culture v. field experiments, and other related topics. The mathematical expression is based upon the development of the observation that "if Hellriegel's experimental results . . . on the variation of dry matter produced as a function of the water content of the soil are platted, it is found that the points lie approximately on a parabola," and that "Wollny's experiments . . . show that the optimum water content of the soil corresponds also to the maximum efficiency of the mineral nutrients, i. e., to their maximum absorption." From the equation obtained from these facts is developed the expression of the value of the derivative $\left.\frac{dy}{dt}\right)$ of the quantity of nutrient absorbed with respect to time.

Section 2, on the law of the minimum and its implication, discusses the results of field experiments (American, French, and Austrian), presents an analysis and synthesis of results, takes up the so-called luxury consumption of elements, and states that "the optimum ratio of the constituents of a fertilizer may then be defined as that ratio which, on the addition of any one of its nutrient constituents—nitrogen, phosphorus, or potassium—results in no increased utilization by the plant of any of the other elements as determined by the time-absorption-graph method." This section discusses also the extension of the concept of ionic balance to all elements.

Section 3, on the mechanism of the reciprocal action of ions in their relation to absorption, deals with the relation of dissociation constants to antagonism and causal factors as yet undetermined. Section 4, on the influence of other factors in producing selective absorption by plants, takes up the absorption of the so-called physiologically acid and alkali salts under the subcaptions of the effect of the H-ion concentration of the substrate and the influence of membrane hydrolysis on the selective absorption of ions.

**Relative effectiveness of limestone particles of different sizes,** T. L. LYON (*New York Cornell Sta. Bul. 531 (1931), pp. 13, figs. 3*).—The experiment here discussed was undertaken for the purpose of determining the degree of fineness to which a limestone of known hardness should be ground to be most effective.

The ground limestone was separated into particles of the 4 sizes, 5–10 mesh, 10–25 mesh, 50–80 mesh, and <200-mesh. Each size of particles was applied at three different rates. During the 9 years covered by the experiment, farm manure was applied from time to time and commercial fertilizer annually. The acid surface soil used was placed in galvanized iron rims painted inside and out and having a diameter of 24 in., this surface occupying a depth of 12 in. in the rims over a subsoil of a depth of 2 ft. Barley, red clover or soybeans, and chard or rape, were grown in rotation.

Except in the case of the heaviest applications (which reduced the size grades to about the same effect), the 5–10 mesh limestone increased the yields less than did any of the smaller sizes. The 10–25 mesh produced considerably larger yields than did the 5–10 mesh, and very little less than did either of the finer-ground grades. The total yields resulting from treatment with the 50–80 mesh and the <200-mesh were slightly larger for the 50–80 mesh grade.

"It was apparent that while the 200-mesh stone produced larger yields when first applied than did the 50-80 mesh, the beneficial effect disappeared more rapidly. On the other hand, the coarsest particles, 5-10 mesh, failed to show a relatively greater benefit as time progressed. The results obtained from this experiment would suggest that a soft limestone, such as the one here used, should be ground to a condition in which all of the particles would pass through a 10-mesh sieve. This would give enough of the finer-sized particles to make the limestone immediately effective.

"A study of experiments conducted elsewhere, in some of which hard, and in others soft limestone was used, indicates that when hard limestone is ground it should be pulverized more finely than should a soft stone."

**Sulfur oxidation and reaction effects in Alberta soils,** O. R. YOUNGE (*Sci. Agr., 11 (1931), No. 8, pp. 535–541*).—The sulfur oxidizing power of three soils, each from a different major soil belt of Alberta, was determined by laboratory experiments, the soluble sulfates being used as an index.

"The Black, Brown, and Wooded belt soils under investigation all possess definite and vigorous sulfur oxidizing powers. The greatest rate of oxidation took place during the first six weeks of incubation. A marked difference exists in the oxidizing power of the three soils studied. The Black soil possesses the highest capacity, the Brown soil is somewhat lower, and the Wooded soil is considerably lower, with only about one-half the oxidizing capacity of the Black soil.

"The supplementary fertilizers did not consistently increase or decrease the rate of sulfur oxidation in the soils except in one case, in which superphosphate added to Wooded soil caused a depression of the sulfur oxidized at the end of each incubation period as compared with sulfur alone. The organic matter (clover) had a stabilizing effect on sulfur oxidation in all soils, tending to produce a steadier increase in the amounts of sulfur oxidized."

With reference to changes in hydrogen-ion concentration it was observed that the pH value of two of the soils had been lowered somewhat six weeks after the application of 2,000 lbs. of sulfur to the acre, but after 10 weeks these soils had reverted to their original reaction. The application of 6,000 lbs. of sulfur to the acre, however, lowered the pH value of one of these soils from 6.2 to 3.2, the other from 7.2 to 4.2.

**Sulfur oxidation in Alberta soils and related experiments, J. D. Newton** (*Sci. Agr., 11 (1931), No. 9, pp. 612–622, figs. 3*).—This contribution notes experiments on the practical application of the observations of Younge above noted to the control of potato scab by a lowering of the soil pH value through sulfur treatment. Some success in the control work was attained, and "the numbers of bacteria were generally reduced by increase in acidity, but the numbers of fungi were not correspondingly reduced."

**Inspection of commercial fertilizers, H. D. Haskins** (*Massachusetts Sta. Control Ser. Bul. 60 (1931), pp. 50*).—This is the fifty-eighth report of the Massachusetts fertilizer control, and contains the usual guaranties and analyses and related data.

## GENETICS

**Inheritance of height in broomcorn, J. B. Sieglinger** (*Jour. Agr. Research [U. S.], 44 (1932), No. 1, pp. 13–20, figs. 4*).—The crossing of a standard (tall) broomcorn with western dwarf or whisk dwarf broomcorn resulted in an $F_1$ plant with the height of the standard parent and in $F_2$ a single factor segregation of three tall to one dwarf. A cross of western dwarf and whisk dwarf broomcorns produced an $F_1$ plant with the height of standard broomcorn, and in $F_2$ there was a two-factor segregation of nine standard to three western dwarf to three whisk dwarf to one double dwarf. Considering standard broomcorn as possessing two height factors, $A$ and $D$, and the western dwarf as lacking $D$ and whisk dwarf as lacking $A$ is held to provide a simple explanation for the standard height of the $F_1$ plants obtained when either type of dwarf broomcorn is crossed with other sorghums. The tall $F_1$ plants usually have been considered entirely a result of hybrid vigor.

**Inheritance of the annual flowering tendency in the cultivated beet** [trans. title], O. Munerati (*Ztschr. Zücht., Reihe A, Pflanzenzücht., 17 (1931), No. 1–2, pp. 84–89, figs. 3*).—A brief report of a study conducted at the Beet Culture Experimental Station, Rovigo, Italy, in which reciprocal crosses were made between beets exhibiting the tendency to shoot to seed the first growing season and those of the usual biennial type. Whether the annual type beet was used as pollen or ovule parent the resulting seedlings were all of the annual type, indicating that the premature flowering tendency is dominant. That inheritance was controlled by a single Mendelian factor was indicated in a 3 : 1 segregation in the $F_2$ generation.

**Paternal and maternal inheritance in Fragaria,** G. L. RYGG and G. M. DARROW (*Science, 75 (1932), No. 1940, pp. 269, 270*).—Using strawberry parents of strikingly different size and appearance, clear cases of maternal and paternal inheritance were observed in a cooperative breeding study conducted by the U. S. Department of Agriculture and the Oregon Experiment Station. For example, in a lot of 2,015 seedlings of Gold Dollar (*F. virginiana* × *F. chiloensis*) × *F. cuneifolia* there were observed 37 plants showing paternal inheritance, the interesting fact being that both parents possess the same number of chromosomes, 28. In the reciprocal cross *F. cuneifolia* × Gold Dollar there was noted 1 plant among 207 seedlings displaying apparently pure maternal inheritance. Measurements of a plant with pure paternal inheritance from a Marshall × *F. cuneifolia* cross showed this plant to weigh 130 gm. and to possess 67 leaves of an average size of 16.6 sq. cm., as compared with 700 gm. and 105 leaves of 106 sq. cm. for the true hybrids. The paternal seedling thus lacked decidedly in the vigor resulting from hybridity.

**Hybrid sterility and incompatibility,** A. E. WATKINS (*Jour. Genetics, 25 (1932), No. 2, pp. 125–162*).—Various phases of the phenomena are discussed and explained, with appropriate examples, under the topics of pollen germination and pollen tube growth, fertilization, seed development, chimeras, and the origin of triploids and tetraploids from diploids. A list of 55 references is included.

**Transplantation of tissues in hybrids of inbred families of guinea pigs and the individuality differential,** L. LOEB and H. C. MCPHEE (*Amer. Nat., 65 (1931), No. 700, pp. 385–405*).—This is an account of experiments in tissue transplantation between hybrid guinea pigs of the same inbred families and between hybrids of these families and unrelated individuals or individuals of one of the parent families. The success in the development of the grafts was related to the similarity in genetic constitution between the donor and host. Tissue was more successfully transplanted between sibs of the inbred families than between hybrid sibs, although the latter gave more favorable results than ordinary syngenesiotransplantation in noninbred families Transplantation of tissues between hybrids of two inbred families and the parent families gave somewhat variable results. It appears that the severity of the reaction to the transplanted tissue is related to the number of gene deviations.

**A Lamarckian experiment involving a hundred generations with negative results,** W. E. AGAR (*Jour. Expt. Biol., 8 (1931), No. 1, pp. 95–107, figs. 2*).—The effects of removing the dorsal branch of the second antenna of Simocephalus and Daphnia for from 5 to 101 generations in different lines were tested on the ability of the antenna to regenerate, with negative results. Consideration was given to the amount of normal growth and to the character and extent of regeneration.

**Congenital ear and skull defects in swine,** J. E. NORDBY (*Jour. Heredity, 21 (1930), No. 12, pp. 499–502, figs. 2*).—Defects of the external ear in swine were observed at the Idaho Experiment Station to be associated with the presence of a number of defective bones in the skull.

**Dominant and recessive spotting separately localized in the domestic guinea pig** [trans. title], A. PICTET (*Ztschr. Induktive Abstam. u. Vererbungslehre, 59 (1931), No. 2–3, pp. 153–189, figs. 6*).—Studies of the inheritance of spotting in guinea pigs indicate the presence of two types, one of which is dominant and caused by the factor *P*, while the other is recessive and caused by the factor *u*. These factors were segregated so that strains containing the single type of spotting were developed. When *Pp* individuals were crossed, 52 of 71 of the offspring showed the generalized spotting characteristic of the action of the *P* factor. When *Uu* individuals were crossed, 19 of the 69 $F_2$ individuals showed the localized spotting characteristic of the action of the *uu* genes. The recessive (localized) type of spotting inhibited the appearance of the dominant (generalized) spotting. When dihybrids (*PpUu*) were crossed, there were produced 63 individuals with generalized spotting, 31 with localized spotting, and 22 uniformly colored, agreeing closely with the 9 : 4 : 3 ratio expected.

Some matings were also reported with albinos and with dominant spotted individuals showing different degrees of spotting.

**Pattern genes in the platyfish,** M. Gordon and A. C. Fraser (*Jour. Heredity, 22 (1931), No. 6, pp. 168–185, figs. 8*).—Four melanic patterns designated as one-spot, twin-spot, moon, and crescent in *Platypoecilus maculatus* are described. Each of the patterns appeared to develop as the result of a dominant autosomal gene. These factors appeared to form an allelomorphic series.

**Spur dichotomy in the ovariotomized Brown Leghorn,** L. V. Domm (*Anat. Rec., 48 (1931), No. 2, pp. 257–265, figs. 3*).—The author describes three cases in ovariotomized Brown Leghorn fowls where double spurs appeared. Two of these were restricted to the left side, while the doubling of the spurs appeared on both sides in the third bird.

**Development of the egg as seen by the embryologist,** G. L. Streeter (*Sci. Mo., 32 (1931), No. 6, pp. 495–506, figs. 7*).—An account of the development of different mammalian ova as observed in studies of the department of embryology of the Carnegie Institution of Washington. Theoretical schemes regarding the development of ova in man are also suggested.

**Prepubertal growth of the ovarian follicle in the albino mouse,** E. T. Engle (*Anat. Rec., 48 (1931), No. 2, pp. 341–350, figs. 2*).—Data are reported on the weight of the ovaries and mean diameter of the 10 largest follicles and of the 60 largest follicles found in the ovaries of rats killed at daily intervals from the fourth to the thirty-seventh day of age. With a few exceptions 3 females were killed on each of the days. Following the appearance of the antrum folliculi on the twelfth to the fourteenth day, there was a sudden increase in the size of the follicles. Atresic follicles were observed about the twentieth day, and these remained fairly constant in number until puberty.

**The reproductive processes of certain mammals.—Part I, The oestrous cycle of the Chinese hamster (Cricetulus griseus),** A. S. Parkes (*Roy. Soc. [London], Proc., Ser. B, 108 (1931), No. B 755, pp. 138–147, pls. 3, figs. 3*).—A study of the oestrous cycle in the Chinese hamster (*C. griseus*) is reported. The average cycle was about 4.5 days in length, which included 0.5 day for prooestrum, 1.5 days for oestrum, and 2.5 days for dioestrum. Changes in the vagina, uterus, and ovaries associated with different conditions in the cycle are noted.

**First findings of tubal ova in the cow, together with notes on oestrus,** C. G. Hartman, W. H. Lewis, F. W. Miller, and W. W. Swett (*Anat. Rec., 48 (1931), No. 2, pp. 267–275, figs. 5*).—An account of the study previously noted (E. S. R., 66, p. 324).

**On the spermatogenesis of the racoon dog (Nyctereutes viverrinus), with special reference to the sex-chromosomes,** O. Minouchi (*Cytologia, 1 (1929), No. 2, pp. 88–108, pls. 2*).—Spermatogenesis in the racoon dog is described. The diploid chromosome number was 42 and the haploid number 21, including the sex chromosomes. Although the racoon dog resembles the domestic dog in anatomical characteristics, no chromosomal evidence was found to indicate the genetic relationship.

**Some observations on the secondary sex ratio in a group of Dairy Shorthorn and Welsh Black cattle,** E. J. Roberts (*Jour. Agr. Sci. [England], 20 (1930), No. 3, pp. 359–363*).—Data are reported on the sex ratio of calves born in 18 herds of Welsh Black and Dairy Shorthorn cattle. The individual herds showed variations in their sex ratio from 76.3 to 139.1 males per 100 females, but when combined there were 2,447 bull calves and 2,465 heifer calves, giving a ratio of 99.3 males per 100 females. The sex ratio of calves born from March to August was 94.8 males per 100 females as compared with 106 males per 100 females for calves born from September to February. Study of the influence of age on sex ratio was complicated by differences in the season of calving of cows of different ages.

**The contribution of the dam in inheritance of milk and butterfat,** L. Copeland (*Jour. Dairy Sci., 14 (1931), No. 5, pp. 379–393, figs. 6*).—A study is reported of the relation of the production records of 694 Jersey cows in the Register of Merit which also had Register of Merit daughters and sons and the production of their daughters and sons' daughters. The results showed that for each 100 lbs. of change in the fat production of the dams from the average the daughters' production changed 32 lbs. The correlation found was 0.4044±0.0278. A correlation of 0.3415±0.026 was obtained between the production of the dams and their sons' daughters' production. Other correlations calculated were 0.3679±0.025 between the production records of the dams' daughters and the dams' sons' daughters, 0.3440±0.029 between dams' sisters and dams' sons' daughters, and 0.4046±0.028 between dams' sisters' and dams' daughters' production. This study indicates that more attention should be given to the dams' production records in the selection of breeding animals.

**Four-ounce eggs from Manchuria,** T. Kohmura (*Jour. Heredity, 22 (1931), No. 3, pp. 77–80, fig. 1*).—An account is given of studies begun at the South Manchuria Railway Company Experiment Station in breeding fowls laying a very large egg. Of 25 domestic hens selected 3 laid eggs averaging from 80 to 86 gm. each, 10 laid eggs averaging from 70 to 79 gm. and 12 laid eggs averaging from 63.5 to 69 gm. per egg. A pullet laid a single-yolked egg weighing 113 gm. Only about 72 per cent of the eggs were fertile in 1929 and 1930, and only 46 per cent of the fertile eggs hatched. An attempt is being made by continued breeding to establish a large egg strain.

**Heredity in swine** [trans. title], R Gärtner (*Züchtungskunde, 6 (1931), No. 7, pp. 241–249*).—A review of the known hereditary factors in swine, including their mode of inheritance.

**Inheritance in horses** [trans. title], A. Walther (*Züchtungskunde, 6 (1931), No. 4, pp. 121–125, fig. 1*).—A brief review of recent publications on the inheritance of characters in horses.

**Studies of color genetics in horses of the Altai region** [trans. title], W. Amschler (*Züchtungskunde, 6 (1931); No. 7, pp. 250–256, figs. 4*).—This is a discussion of the occurrence of stripes on the legs and shoulders of horses of certain Asiatic breeds and theories of their possible relationship in origin.

**The silver mouse,** L. C. Dunn and L. W. Thigpen (*Jour. Heredity, 21 (1930), No. 12, pp. 495–498, fig. 1*).—The inheritance of silver gray in mice, an English fanciers' type, was studied. This condition differed from black by a single recessive factor which also caused silvering in chocolates. Another variety, described as pink-eyed silver, was apparently due to the recessive dilution gene. Other combinations were produced, including especially silver agouti and silver yellow.

**On the nature of size factors in mice**, C. V. Green (*Amer. Nat., 65 (1931), No. 700, pp. 406–416*).—Data are reported on the weight, length of body, tail, skull, humerus, femur, and tibia, diameter of femur, and skull capacity of male and female mice of the species *Mus bactrianus* and *M. musculus* and hybrids between these species.

The measurements showed that in a number of characters the $F_1$s were significantly smaller than the larger parent, whereas in other characters the differences were less than three times the probable error. The $F_1$ males exceeded the *musculus* males in skull length, femur length, and sagittal diameter of the femur. These findings were taken to indicate that not all size characters are subject to the influence of general factors. In further support of this idea correlation coefficients were computed for various pairs of characters, and these were found to show wide differences. For instance, the femur and tibia lengths showed relatively high correlations in all cases, but much lower correlations were shown between the length of either of these bones and the length of other portions of the body. As females in general presented higher correlation coefficients than males, it is suggested as a possibility that general size factors may play a more important part in the females.

**Linkage of the factor shaker with albinism and pink-eye in the house mouse**, W. H. Gates (*Ztschr. Induktive Abstam. u. Vererbungslehre, 59 (1931), No. 2–3, pp. 220–226*).—In continuing these studies (E. S. R., 62, p. 215), backcrosses were made which indicated linkage between the shaker character and pink eye in the house mouse. The crossing-over percentage calculated was 14.70±5.08.

**The development of hair in the rat** [trans. title], R. Danneel (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u. Ökol. Tiere, 20 (1931), No. 4, pp. 733–754, figs. 19*).—A description is given of the formation of the rat hair, dealing with the formation of the follicle, the appearance of the hair root in the follicle, and the breaking of the hair through the epidermis.

**The inheritance of " hairlessness " in swine**, E. Roberts and W. E. Carroll (*Jour. Heredity, 22 (1931), No. 4, pp. 125–132, figs. 6*).—In continuing the studies of the inheritance of hypotrichosis in swine at the Illinois Experiment Station (E. S. R., 58, p. 320), it appears that this condition is partially recessive to the normal. Heterozygous animals are intermediate as concerns their hair character. Studies of the skin of affected animals showed that a similar number of fully developed hair follicles were present. The administration of iodine and cystine did not correct the difficulty in hair growth.

**A naked lamb**, E. T. Popova-Wassina (*Jour. Heredity, 22 (1931), No. 3, pp. 89–92, fig. 1*).—An account is given of a hairless ram produced in a Russian flock of sheep that had been inbred without the introduction of outside blood for 20 years.

## FIELD CROPS

**[Agronomic experiments in Alabama, 1931]**, R. Y. Bailey, E. L. Mayton, J. T. Williamson, H. B. Tisdale, D. G. Sturkie, G. L. Fick, C. L. Isbell, R. W. Taylor, L. M. Ware, and J. F. Duggar (*Alabama Sta. Rpt. 1931, pp. 13–19, 47, 52, 53, 54, 55*).—Field crops work (E. S. R., 65, p. 428) reported on embraced variety tests with cotton, corn, and sweetpotatoes; fertilizer trials with cotton and potatoes; planting tests with oats (E. S. R., 66, p. 132) and potatoes; pasture studies; tests of Crotolaria species for soil improvement; and fertilized crop rotations. Results of studies of factors affecting lint development of cotton, of the influence of sodium nitrate on Sudan grass hay, and of the time of cutting Sudan and Johnson grass for hay were in harmony with previous findings.

On an area sown (1925–1926) to clovers, grasses, and grass mixtures, variously fertilized and limed, and harvested beginning in 1927 with a lawn mower as often as there was enough growth, the only plants withstanding the conditions were hop clover in the early spring and Dallis, carpet, and Bermuda grasses and lespedeza in the summer. Fertilizer high in nitrogen and low in minerals produced the largest increase on all sections, yet all treatments gave relatively small increases over check plats. Treatment with a complete fertilizer plus lime resulted in a better balanced sod as to clovers and grasses than with the fertilizer alone. The highest yields on plats fertilized similarly were made on areas where Dallis grass was in the mixture. This grass endured summer drought better than either carpet grass or Bermuda grass. Lespedeza grew well in a mixture with Dallis and Bermuda grasses but was crowded somewhat by carpet grass.

Potato storage studies failed to show great differences in keeping qualities of tubers produced under different fertilizer treatments, yet certain consistent differences were observed at each of three temperatures. The greatest shrinkage losses occurred in potatoes grown on unfertilized plats and the least in those from plats fertilized most heavily. Tubers from plats treated with phosphorus and potassium but no nitrogen showed consistently a relatively high shrinkage loss. Little differences in shrinkage were noted when the principal ingredients of a complete fertilizer were derived from different sources. Potatoes from all treatments kept well. No consistent differences in composition of the tubers due to fertilizer treatment were established, except where treatment delayed maturity. Less mature tubers were low in starch and high in moisture.

Inoculation of both shelled and unhulled seed peanuts usually resulted in a large increase in the average number of nodules per plant, and this increase at harvest 4 months after a June 12 planting was accompanied by substantial increases in number and in weight of sound nuts and in the total weight of tops, nuts, and roots. Applications of superphosphate 400 lbs. per acre, basic phosphate 600 lbs., or hydrated lime 400 lbs., each in intimate contact with the peanut seed. resulted in a notable decrease in average number of nodules per plant, at least during the first 6 weeks of growth, whereas dusting 200 lbs. of sulfur per acre in like contact with untreated seed was followed by decided increases in number of nodules. Korean lespedeza again developed only a late and inadequate supply of nodules, while Kobe, common, and Tennessee 76 had several times as many per plant. Treating the seed of Korean lespedeza with a culture made from its own nodules usually increased the average number of nodules per plant. Perennial lespedeza inoculated with a culture from its own nodules averaged at the end of the season 65 nodules per plant as compared with 18 with no treatment.

Nut grass tubers were not found below a layer 14 to 16 in. deep in Norfolk sandy loam soil. Tubers taken from the first 16 in. of a square yard averaged 1,122, of which the upper 8 in. contained 1,044. Tubers planted in pots early in July formed new tubers and decayed by November 15, indicating that an actively sprouting tuber does not live normally longer than one growing season. No sprouts were sent to the surface by tubers planted deeper than 3 ft. The depth of soil from which tubers were taken was not definitely related to the depth from which they could send sprouts. Nut grass planted in pots on July 2 and clipped just below the soil surface whenever sprouts appeared, produced no new tubers during the season, while unclipped nut grass formed 84 new ones from a single tuber. Tubers failed to germinate when their moisture content had been reduced to 24 per cent by 4 days' exposure to sunlight, and those dried at room temperature or in a desiccator failed to germinate after the moisture content was down to 15 per cent. The thermal death point of the tuber appeared to be between 50 and 60° C.

**[Field crops investigations in India, 1928–29]** (*India [Dept. Agr.] Rev. Agr. Oper., 1928–29, pp. 13–59, 67–78, 90, 91, pls. 3*).—Agronomic experiments and plant breeding work carried on by the imperial and provincial departments of agriculture in different localities in India were along the same general lines as previously reported (E. S. R., 61, p. 518).

**Spring seeding of alfalfa,** L. R. NEEL (*Tennessee Sta. Circ. 40 (1932), pp. 2*).—Alfalfa was successfully spring sown March 15 to April 13 on well prepared and inoculated fertile brown loam at the Middle Tennessee Substation, the best average yields coming from a 20-lb. rate and without a nurse crop. During the first year the crop was clipped late in June and again in August or early September in order to destroy weeds.

**The effect of uniformity of spacing seed on the development and yield of barley,** H. B. SPRAGUE and N. F. FARRIS (*Jour. Amer. Soc. Agron., 23 (1931), No. 7, pp. 516–533, figs. 5*).—The relation between uniformity of spacing the seed of barley and the development and yield of the crop was studied in 1929 under field conditions at the New Jersey Experiment Stations. In the uniform planting method used, each foot of row received kernels evenly spaced and equivalent to 10 pk. per acre, whereas in the variable method the average seeding rate was 10 pk. per acre but consecutive sections of the row were planted at rates equivalent to 6, 9, 11, and 14 pk. per acre and a random distribution of the four rates was provided. Three rows of each method alternated throughout the test field, and observations were confined to the center rows.

Yields of grain and straw increased with the seeding rate when the component rates of the variable method were considered, but the increase in yield was far from proportional to population density, due to the reduced development of individual plants at the closer spacings. Indications were that the barley plant has considerable ability to modify its development in response to the soil resources available. The average grain yield from the variable method slightly exceeded that from the uniform method. No reduction in average straw yields resulted from irregularities of stand. Thickly populated areas seemed to draw on the soil resources of neighboring sparsely populated areas. The balance of the adjustment needed for normal yields was caused by increased development of individual plants in thin stands. The variability of the soil was far more important in determining yields of units of the planted row than was population density. Mean values of individual plant characters were not changed appreciably by the irregularity of spacing seed, nor was the reliability of the mean values affected significantly.

Root systems were not confined to the vertical zone occupied by the aerial portions, and top growth of individual plants seemed to be correlated with root development. Conclusions were that such crops as oats, wheat, and rye, reported to develop more extensive root systems than barley, probably can utilize even more completely the soil resources in spite of considerable irregularity of stand.

"American grain drills, when functioning normally, may be assumed to distribute seed of small grains satisfactorily so far as total yield of crop is concerned. The factor of regularity in spacing seed may be largely ignored in conducting rate-of-seeding tests, even though the variation in seeding rate varies as much as 40 per cent from the mean in consecutive sections of the row."

**The shedding of nodules by beans,** J. K. WILSON (*Jour. Amer. Soc. Agron., 23 (1931), No. 8, pp. 670–674*).—Red kidney beans were grown at Cornell University in soil with controlled moisture content. After nodulation a reduction of soil moisture from 20 to 12.5 per cent for 24 hours caused the bean roots to shed on the average about 36 per cent of their nodules. On some individual plants 57 per cent of the nodules were affected destructively by this drop in moisture. The shedding was more free on small and fibrous roots than on larger roots.

**Hop clover,** L. R. NEEL (*Tennessee Sta. Circ. 41 (1932), pp. 4*).—Hop clover (*Trifolium procumbens*), a true clover widely distributed throughout the country, proved of value in the grass and clover mixture for a permanent pasture and useful in improving thin soil and land infested by broom sedge and weeds. At the Middle Tennessee Substation it sometimes affords as much as 1 ton of hay per acre. Directions for its culture and saving its seed are given.

**An indication that corn tillers may nourish the main stalk under some conditions,** G. H. DUNGAN (*Jour. Amer. Soc. Agron., 23 (1931), No. 8, pp. 662–670, figs. 3*).—The removal of tillers from corn plants in the early milk stage at the Illinois Experiment Station caused a slight reduction in yield and test weight of grain. As to the yield and test weight of grain, individual plants with suckers were very slightly superior to those without suckers. When plants with and without suckers were defoliated when the grain was in the early milk stage the plants with suckers were strikingly superior in grain yield, test weight per bushel, weight per 100 grains, diameter and length of ear, and weight of ear bearing stalks, and the differences were statistically significant. Defoliation when the ear shoots were just emerging resulted in no further growth of the main stalk, but a faster main stalk-like growth of the suckers. Removal of all blades from plants with no suckers resulted in complete barrenness.

**The Ishan cotton plant under mixed cultivation, II,** E. H. G. SMITH and A. V. GIBBERD (*Nigeria Agr. Dept. Ann. Bul., 9 (1930), pp. 35–48, pls. 2*).—Further investigation (E. S. R., 65, p. 528) on the effects of intercropping with yams on the cotton plant, considered with the previous work, showed that intercropping results in a basic or primary depression in growth of about 10 per cent from which there is no recovery. The growth is retarded due to the competition with the yams for available soil moisture during the short dry season, reaching a maximum of 20 per cent, but thereafter a gradual recovery takes place which continues until complete recovery just before senescence. The depression and retardation of growth caused flower production and hence boll production and yield to be reduced by from 25 to 35 per cent. The heavy shedding of flower buds normally occurring with indigenous cotton before rains stop is reduced by intercropping, as the development of the intercropped plants is depressed and retarded at this time. Intercropping increased the proportion of the crop borne by the sympodia and decreased that borne by the monopodia. There was some evidence that intercropping somewhat retards flowering and bolling and that it reduces the mean maximum lint length. Intercropping did not affect shape of plant, boll shedding, mean boll weight, or period of maximum maturity of the crop. The competitive effect of the yam did not go beyond a radius of 3 ft.

**Dehiscence of the boll of Linum rigidum and related species,** A. C. DILLMAN and J. C. BRINSMADE, JR. (*Jour. Agr. Research [U. S.], 44 (1932), No. 1, pp. 21–27, figs. 3*).—The mechanism of the dehiscence of the bolls or capsules of the yellow-flowered flax (*L. rigidum*) and of several related species native to the Great Plains of North America is described in this contribution from the U. S. Department of Agriculture. In these species the capsules open when wet by rain, in contrast to those of other flaxes which dehisce by drying. The opening of the capsules in *L. rigidum* depends upon the definite action of a hingelike organ which forms the attachment of each segment of the capsule to the receptacle. The five segments of the boll are pushed open by the rapid expansion of the inner tissues of the organ, which absorb water through minute orifices at the base of and between the segments.

**Lespedeza sericea,** C. A. Mooers (*Tennessee Sta. Circ. 42 (1932), pp. 4*).—*L. sericea* is described as apparently well adapted to poor land, low in lime requirement, and able to maintain a stand under adverse conditions. The plants are deep rooted, endure drought, and thus far have shown no serious susceptibility to disease. Untreated seed germinated slowly and continued to come up for months, but germination was increased decidedly by scarification or treatment with sulfuric acid. Good stands were obtained from broadcasting 25 lbs. of acid treated seed or 5 lbs. of untreated seed in 2.5-ft. rows. While in Tennessee untreated seed may be sown successfully at any time from November 1 to August 1, scarified seed should be sown only in late spring or summer. Seed yields have ranged from 200 to 900 lbs. per year from plants over 1 year old. In the dry year 1930 *L. sericea* for hay outyielded alfalfa, red clover, and lespedeza No. 76. In composition the first-year hay, fall-cut when about 1 ft. high, closely resembled annual lespedeza. A pasture trial with sheep and a feeding trial of the hay with steers at the West Tennessee Substation are noted briefly. Both the feeding trial and the composition indicate that *L. sericea* hay is not equal to alfalfa in feeding value, but it is eaten readily and seems to be superior to grass hay.

**Studies in sorghum.—I, Anthesis and pollination,** G. N. R. Ayyangar and V. P. Rao (*Indian Jour. Agr. Sci., 1 (1931), No. 4, pp. 445–454, pl. 1*).—The course of anthesis in varieties of *Sorghum durra*, *S. roxburghii*, and *S. nervosum* are traced and pollination is discussed briefly.

**Imperial Sugar Cane Research Conference, London, 1931: Report of proceedings** (*London: [Gt. Brit.] Empire Marketing Bd., 1932, pp. 171*).—A brief report of proceedings of the conference held under the auspices of the Empire Marketing Board in London from July 20 to 24, 1931, is presented, with resolutions adopted and a list of members. The report includes a paper on Sugar Cane Economics, by C. A. Barber (pp. 34–65), a world economic survey of sugar (pp. 13–33), and accounts (pp. 65–88) of the economic position of the industry in South Africa, India, British Guiana, the British West Indies, and Fiji. A paper on Sugar Cane Research in the British Empire, by P. S. Hudson (pp. 89–92) is followed by résumés (pp. 92–140) of sugarcane research in Queensland, South Africa, India, British Guiana, the British West Indies, Fiji, and Mauritius. Other articles include The Biological Control of Sugar Cane Pests, by W. R. Thompson (pp. 141–146); Quarantine and the Spread of Sugar Cane Diseases, by S. F. Ashby (pp. 146–151); By-Products of the Sugar Cane Industry, by W. G. Freeman (pp. 151–160); and Report on a Visit to the Proefstation Oost-Java in March-April, 1930, by A. Glendon-Hill (pp. 161–166).

**Studies in Indian tobaccos.—No. 6, The improvement of Indian cigarette tobacco by hybridization,** K. Ram (*Indian Jour. Agr. Sci., 1 (1931), No. 4, pp. 455–472, pls. 6*).—The sixth number of this series (E. S. R., 52, p. 522) describes efforts to produce a tobacco variety retaining the hardy growing characters of a native type and better in quality for cigarettes. Pusa type 28 was crossed with Adcock. In general vigor $F_1$ plants were intermediate between the parents, and neither was completely dominant over the other. In $F_2$ the range of variation was very wide, and the coefficient of variation was more than twice that of either parent. The true parental types did not reappear in $F_2$, and new characters not present in either parent arose. A variety with large pure white flowers appeared in $F_2$, although the flower color in both of the parents of the cross was pink.

**Frost injury to spring wheat with a consideration of drouth resistance,** L. R. WALDRON (*Jour. Amer. Soc. Agron., 23 (1931), No. 8, pp. 625–637*).—Recent breeding work, according to this contribution from the North Dakota Experiment Station, has brought into existence wheat varieties more susceptible to frost than any grown 15 or more years ago. It is pointed out that while injury of wheat by spring frost is unusual, it may occur. Nursery studies at the station furnished data indicating that yields of Hope wheat were so reduced about 13.8 bu. or 38 per cent. Wheat varieties arranged tentatively in order of resistance to frost are Reliance, Red Fife, Marquis, Marquillo, and Hope. Yields of the varieties under semiarid conditions showed in general a positive relationship between frost and drought resistance, i. e., the ranking was Ceres, Reliance, Marquis, Marquillo, and Hope. Other data cited from experiments in the region led to the conclusion that neither Kubanka durum wheat nor emmer showed greater drought resistance than Marquis wheat.

**Spring wheat varieties for South Dakota,** K. H. KLAGES (*South Dakota Sta. Bul. 268 (1931), pp. 44, figs. 14*).—Variety tests with common and durum spring wheat at the station and substations and in cooperation with farmers are reviewed for various periods since 1925, supplementing earlier work (E. S. R., 49, p. 635; 57, p. 530), and information is given on the wheat acreage and producing districts in the State and on results of milling and baking tests made by the U. S. Department of Agriculture on a number of the varieties studied. The characteristics of varieties and selections tested are described briefly.

Ceres, the outstanding hard red spring wheat tested, yielded 20.3 per cent more than Marquis at Brookings, 16.6 per cent more at Highmore over seven years, and 18.8 per cent more at Eureka during 5 years. The yields together with results of milling and baking tests indicating that in quality Ceres equaled if not exceeded Marquis, suggested that Ceres might be recommended to replace Marquis in all parts of South Dakota.

Reward, which gave good yields at Highmore and Eureka, may be grown to advantage as an early-maturing variety in north central South Dakota. Mindum, Arnautka, and Kubanka were outstanding among the durums in yield and quality. Mindum is widely adapted in the State, while Kubanka is particularly adapted to central and western South Dakota. Nodak and Acme were high yielders but low in quality of grain. Mindum showed superiority to Red Durum in cooperative tests in northeastern South Dakota.

Comparative yields in different parts of the State showed that hard red spring and durum wheats yielded very much alike. Since the price differential usually favors hard red spring wheat, it might be profitable for many to grow less durum and more hard red spring wheat of a variety such as Ceres.

**Correlation between yields of winter wheat varieties grown in various locations in the Columbia Basin of Oregon,** J. F. MARTIN and D. E. STEPHENS (*Jour. Amer. Soc. Agron., 23 (1931), No. 8, pp. 638–646*).—Nursery experiments were carried on by the Oregon Experiment Station in cooperation with the U. S. Department of Agriculture in various sections of the Columbia Basin of Oregon to determine the best wheat varieties for each section and the correlation of results at Moro and other localities. Strains of the hybrids Fortyfold × Federation, Arcadian × Hard Federation, Fortyfold × Hard Federation, and Fortyfold × Hybrid 128 gave the highest average yields. Coefficients of correlation between results at Moro and the other nurseries for 2 years indicated that a 2-year average is of value except that differences caused by severe winters and drought may not be accounted for. The varieties ranked close to expectancy when all factors were considered. The data indicated that with one possible exception the outlying nurseries in the Columbia Basin should be continued.

**A study of local variations in protein content of wheat, H. H. Finnell** (*[Oklahoma] Panhandle Sta., Panhandle Bul. 36 (1932), pp. 15, fig. 1*).—Study of commercial wheat samples from the Panhandle region gave indications that there might be some relation between color and the predominating soil type in various localities. Considerable light colored wheat came from localities where sandy loam to loam soil predominate, while much of the dark hard vitreous appearing wheat came from areas with heavier soil types. Continued unfavorable conditions during the spring growing season tending to produce a small kernel or a severe drought affecting the crop just before maturity and producing shriveled kernels may have much to do with the resulting protein content of the grain. Within the Panhandle area the average quality of wheat may be expected to fluctuate considerably from year to year.

When samples from plats at the station were considered in general lower protein contents were found where wheat followed wheat than after a fallow or cultivated crop. Also straw and manure plowed under as soon as possible produced higher quality of wheat the next season than where shallow tillage was practiced. The protein content of wheat from plowed plats under continuous wheat culture closely approached that of wheat grown in crop rotations. Wheat after wheat averaged 13.8 per cent and on fallow 15.5 from 1924 to 1931. From 1928 to 1931 commercial samples averaged 13.65 per cent and wheat on stubble land at the station 13.75 per cent. The protein content in three of the six seasons was medium and relatively high in the remainder. As pointed out earlier (E. S. R.. 66, p. 136) cultural and seasonal conditions appeared to affect protein content far more than varietal differences. It is pointed out that while the protein content of wheat constitutes a production value it has no relation to the acre yield of the grain.

## HORTICULTURE

**[Horticulture at the Alabama Station]** (*Alabama Sta. Rpt. 1931, pp. 50–52, 53, 54*).—Of 51 varieties of grapes planted in 1924–25, 30 had succumbed by 1931, and among the 10 most vigorous and productive kinds listed by O. C. Medlock are Concord, R. W. Munson, and Herbemont. Observations by Medlock upon Stuart and Frotscher pecans stored at various temperatures and relative humidities indicated that nuts keep best at low temperatures and low relative humidities. As the temperature increased the duration of the keeping period decreased, so that at ordinary room temperature and ordinary relative humidity quality was lost in from 10 to 12 months. Perceptible amounts of free ammonia in the storage atmosphere caused the kernels to darken within 10 days. Progress was made by Medlock in the improvement of the blueberry.

The results of varietal and cultural studies with vegetables are reported by C. L. Isbell.

As reported by L. M. Ware, potash did not improve nor did nitrogen significantly lower the shipping quality of strawberries.

**[Horticultural investigations at the Canadian experimental stations and farms]** (*Canada Expt. Farms, Rpts. Supts. 1930, Agassiz (B. C.) Farm, pp. 24–29, 34–37, 38–45, figs. 2; Cap Rouge (Que.) Sta., pp. 23–27; Farnham (Que.) Sta., pp. 20–23; Fredericton (N. B.) Sta., pp. 18–32, 33, fig. 1; Indian Head (Sask.) Farm, pp. 40–44, 45–49; Kapuskasing (Ont.) Sta., pp. 24–29, figs. 2; Lacombe (Alta.) Sta., p. 46; Lennoxville (Que.) Sta., pp. 1, 50–59, figs. 2; Morden (Man.) Sta., pp. 19–40, 43, 57, figs. 5; Nappan (N. S.) Farm, pp. 1, 32–35, 36, 37, fig. 1; Rosthern (Sask.) Sta., pp. 43–52, fig. 1; Scott (Sask.) Sta., pp. 43–50, fig. 1; Sidney (B. C.) Sta., pp. 13–43, figs. 5; Summerland (B. C.) Sta., pp. 4–57, figs. 3*).—Brief reports are again presented (E. S. R., 62, p. 637) by W. H. Hicks, G. A. Langelier, R. Bordeleau, C. F. Bailey, W. H. Gibson, S. Ballantyne, F. H. Reed, J. A. McClary, W. R. Leslie, W. W. Baird, W. A. Munro, G. D. Matthews, E. M. Straight, and W. T. Hunter, respectively, on the results of miscellaneous varietal and cultural studies with fruits, vegetables, and flowers and ornamentals.

**Report of the division of horticulture,** W. T. MACOUN ET AL. (*Canada Expt. Farms, Div. Hort. Rpt. 1930, pp. 77, figs. 14*).—In this annual report (E. S. R., 64, p. 537) a general summary of activities is given.

Several promising crab apples and three standard apples obtained in fruit breeding operations are described.

According to M. B. Davis, the Wealthy apple orchard set in 1896 with trees 10 by 10 ft. apart and which yielded 300 bbls. per acre in its sixth year is now in its decline, showing a net loss in 1930. In general the orchard has shown that early bearing may be induced by close spacing.

Experiments in blueberry culture showed that on a soil of high pH value (7.6 as a maximum) the best growth was made on those plats receiving a mulch of peat and fertilized with aluminum sulfate. Here the pH was reduced to the vicinity of 5.5. Aluminum sulfate alone did not reduce pH value sufficiently to meet the full needs of the blueberry. Incidentally the peat mulch provided cooler and moister conditions for the roots. Blueberry cuttings from bushes which would not layer rooted as high as 80 to 85 per cent when taken in March. placed for about 2 weeks in peat held at 40° F., and then removed to a greenhouse with night temperatures between 50 and 55°.

Apple pollination studies conducted by H. Hill in the Province of Quebec indicated that McIntosh may not always be a reliable pollinizer for Fameuse, there being in 1930 a difference of 5 days in time of blooming. Duchess and Melba blooming coincidentally with Fameuse are considered favorable pollinizers. The ripening of apple pollen was artificially hastened by placing anthers in petri dishes placed beneath Coleman lamps. Duchess was unusually productive of free pollen. The average length of Fameuse, Duchess, Wealthy, Golden Russet, McIntosh, and Melba pollen tubes were 702, 402, 732, 560, 706, and 498 microns, respectively. In cross-pollination tests Duchess proved the best pollinizer for Fameuse. McIntosh × McIntosh yielded 3.6 per cent of harvested fruit, Fameuse × Fameuse 0.2, Wealthy × Wealthy 0.5, and Duchess × Duchess 0.4 per cent. No set was obtained with Fameuse, Wealthy, and Golden Russet flowers simply bagged and very slight sets with McIntosh and Duchess.

Observations by Machacek at Abbotsford, Que., on the comparative amounts of fire blight on apple trees fertilized in different ways did not support the contention that applications of nitrogen tend to increase the suceptibility of the apple tree to blight.

Using young Joyce apple trees grown in pots and supplied with nitrogen in the autumn and early spring, Davis and Hill reached the conclusion that nitrogen applications made later than September 1 are of little value in promoting growth the following season. Early fall applications did influence the color of apple leaves but also delayed the ripening of the wood. The applicability of the results to the field is questioned.

As reported by Davis, the Nova Scotia apple varieties Baldwin, King, Ribston, and Roxbury are low in tannin as compared with English cider varieties but do, with the exception of King, yield a very acceptable cider. The technical processes of cider manufacture are outlined in detail.

Vegetable gardening studies reported by T. F. Ritchie include observations on a new variety of eggplant designated as Blackie, obtained by crossing Black Beauty and Nagasaki. Attempts to develop a small-sized, wrinkled pea were successful. Laxton Progress × English Wonder yielded some promising large-seeded canning type peas. The tomato cross Alacrity × Earlibell yielded a very early-ripening tomato designated as Abel. A back-cross of Bonny Best × Alacrity seedlings to the Bonny Best parent yielded some excellent types, and from a Livingston Globe × Bonny Best cross there was secured a promising red-fruited seedling. Promising sweet corns were obtained in the crosses Golden Bantam × Pickaninny, Banting × Golden Bantam, and Country Gentleman × Pickaninny. An electrically operated device for pollinating tomatoes is described.

Paper mulch studies were carried on with 16 kinds of vegetables, among which cucumbers, muskmelons, and peppers responded favorably. Temperature was slightly higher under the paper in May, June, and July, and lower in August. None of the papers tested lasted more than one season. A list of desirable vegetables for the Ottawa region is presented. A promising new variety of greenhouse cucumber was obtained by crossing the Hescrow and Deltus varieties.

The results of canning studies with red raspberries are reported by E. W. Hamilton, with the observation that Latham and Herbert gave the best products.

In the section on ornamental gardening, certain new lilacs originated at Ottawa are described by I. Preston and notes presented on a large number of climbing roses and iris. The results of sweet pea trials in the greenhouse are presented in tabular form.

**Effects of calcium deficiency on nitrate absorption and on metabolism in tomato,** G. T. Nightingale, R. M. Addoms, W. R. Robbins, and L. G. Schermerhorn (*Plant Physiol., 6 (1931), No. 4, pp. 605–630, figs. 3*).—Marglobe tomato plants grown in a quartz sand supplied with nutrient solutions lacking in calcium or nitrates or both were studied at the New Jersey Experiment Stations with respect to growth and chemical composition of the tissues.

Unlike the effects of a lack of nitrogen, phosphorus, or potassium, in which green color is retained longest in the uppermost leaves and stem tip, the lack of calcium caused the upper part of the plant to yellow first. The roots of calcium-deficient plants were characteristically short, bulbous, and brown at the tips, with sloughing of cells farther back. Calcium-deficient plants were practically unable to absorb or assimilate nitrates, although they absorbed calcium instantly. There was a large accumulation of carbohydrates, probably incident to the nonassimilation of nitrates. Translocation of sugars and digestion of starch occurred freely in the calcium-deficient plants. The calcium of the fresh tissues of calcium-deficient plants was nearly 100 per cent insoluble in water and was largely located in the older tissues of roots and tops. The insoluble calcium consisted in part of calcium oxalate and in part of combined calcium, and though utilization of the oxalate and reutilization of the combined calcium occurred, the movements were extremely slow.

The shading of calcium-deficient plants resulted in a noticeable decline in combined calcium and an increase in uncombined calcium, followed by the formation of new stem tissues and the absorption of nitrates. Comparable results were attained by supplying calcium to plants in light, suggesting that in both cases uncombined calcium is made available for combination with proteins and other materials.

**Influence of phosphorus deficiency on metabolism of the tomato (Lycopersicum esculentum Mill.),** S. H. Eckerson (*Contrib. Boyce Thompson Inst., 3 (1931), No. 2, pp. 197–217, pls. 2, figs. 5*).—Using Bonnie Best tomato plants grown in sand with a full nutrient solution and with a minus phosphorus solution, the author found that plants grown with abundant nitrate but without phosphate were essentially nitrogen starved, a result due apparently to the rapid decrease in reducase activity, which ceased altogether when the phosphate and water-soluble organic phosphorus compounds were exhausted. A series of related changes followed the loss of reducase activity—nitrates accumulated, sugars and starch increased, acidity increased, cell walls thickened, cell division at root and stem tips decreased, and cambial activity ceased. In extremity the complex phosphorus compounds break down, starch decreases rapidly, phosphatides and proteins begin to disintegrate, and shortly death ensues. Supplying phosphate during the early high-starch stage resulted in a restoration of reducase activity and finally normal growth.

**The effect of carbon dioxide on fruits and vegetables in storage,** N. C. Thornton (*Contrib. Boyce Thompson Inst., 3 (1931), No. 2, pp. 219–244, figs. 7*).—Fruits and vegetables of various kinds were held in carbon dioxide storage for from 3 to 7 days at temperatures of 0, 4, 10, 15, 21, and 25° C. Relative humidity was not controlled but was high in all cases. In general the effect of low concentration of carbon dioxide during storage was to retard respiration, to induce external color changes, and to reduce astringency in green bananas and pears. The effect of a high concentration of carbon dioxide was to impair flavor in all products, inhibit ripening, prevent color changes in the banana, peach, and orange, kill meristematic tissues in such plants as asparagus and potato, and produce internal discoloration and breakdown in certain products and external discoloration in others. Some indication was observed that the reduction of the oxygen content of the atmosphere as a result of increasing carbon dioxide might be the controlling factor in the so-called carbon dioxide injury. In general the percentage of carbon dioxide necessary to cause injury in fruits and vegetables during storage was related to the firmness of the plant tissues and inversely to the amount of moisture on its surface.

**Sterility and degree of productivity in fruit growing in dependence on the pollinating variety** [trans. title], V. V. Pashkevich (Pashkewitch) (*Trudy Prikl. Bot., Genet. i Selek.* (*Bul. Appl. Bot., Genet. and Plant-Breeding*), *1930, Sup. 49, pp. 204, figs. 17; Eng. abs., pp. 197–201*).—The results of pollination experiments carried on in 20 different locations in European Union of Socialistic Soviet Republics with apple, pear, cherry, plum, peach, and apricot trees are summarized. Parthenocarpy was observed in the Antonovka apple and to a limited extent in the Alexander and Longfield varieties. Among 45 varieties of sour cherries 8 proved to be fully self-sterile, and several others approached this condition. Of 8 sweet cherries all are designated as self-fertile, though the least fertile set only 0.09 per cent as compared with 64 per cent for the most fertile variety. Of 25 peaches only 2, one of which was Champion, were self-sterile. The 5 almonds and 2 apricots examined were self-fruitful to varying degrees.

**The prevention of wastage in New Zealand apples,** J. Barker (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest., Spec. Rpt. 39 (1930), pp. V+26, figs. 11*).—Varieties of apples were observed to differ in their optimum temperature requirements in storage; Jonathan and Cox Orange, for example, appeared to hold up better at temperatures of from 36 to 38° F. than at 34°, the optimum for most varieties. Wastage in both experimental and commercial shipments was found due principally to fungi and to overripeness leading to fungus decay. Serious losses were also caused by bitter pit, internal breakdown, soft scald, and freezing. Bitter pit was prevalent in early shipments of Cox Orange and suggested the desirability of later picking for this variety.

Cold storage at the port of loading to precool and hold the fruit in good condition is stated as necessary, and the rapid reduction of the temperature in the ship's hold is deemed desirable.

**Experiments with cherries** [trans. title], V. Brandonisio and F. S. La Notte (*Bari Staz. Agr. Sper. Pub. 19 (1931), pp. [2]+29, pls. 10*).—Stating that the export trade in fresh cherries from the Province of Bari, Italy, to northern European countries is an important industry, information is presented on the results of picking, refrigeration, and other trials conducted at the Bari Agricultural Experiment Station. It was observed that the acidity of cherries diminishes gradually from picking to full maturity, whereas sugar increases during this period.

**Fruit-bud formation in the strawberry in spring in Southeastern States,** G. M. Darrow and G. F. Waldo (*Science, 72 (1930), No. 1866, pp. 349, 350, fig. 1*).—From Virginia northward fruit bud formation in standard varieties of strawberries is limited to autumn. Apparently low temperatures of late fall and early winter cause fruit bud formation to cease, and when spring comes day length is too long. From Georgia to North Carolina shorter winters permit a resumption of fruit bud formation in early spring before the daily light period has lengthened too greatly. At Willard, N. C., the initial stages of fruit bud formation were found as late as April 27. In Florida strawberries evidently initiate fruit buds continuously throughout late fall, winter, and spring.

Weekly records obtained at Albany, Ga., in the spring of 1929 upon four strawberries originated at the Horticultural Field Station, Glenn Dale, Md., showed distinctly different habits of bearing. U. S. D. A. No. 25 produced no late fruit, U. S. D. A. No. 261 a small crop of late fruit, and U. S. D. A. No. 655 and Blakemore produced large proportions, 47 and 63 per cent, respectively, of their fruit in the second crop. Blakemore and U. S. D. A. No. 655 originated as crosses between Missionary and Howard 17, and evidently inherited from the mother the tendency to form fruit buds in the spring in North Carolina and southward where temperature and light are favorable.

**Observations on the red color of the Blood orange,** M. B. Matlack (*Plant Physiol., 6 (1931), No. 4, pp. 729, 730, fig. 1*).—Microscopic studies in the U. S. D. A. Bureau of Chemistry and Soils showed spherites or needle crystals of a deep red to reddish-brown color in the crushed juice sacs. Globules of red solution were also present, probably held in separate cells of the juice sac.

**New citrus hybrids,** W. T. Swingle, T. R. Robinson, and E. M. Savage (*U. S. Dept. Agr. Circ. 181 (1931), pp. 20, pls. 10*).—Preceded by a brief discussion of the authors' work in citrus breeding, there are presented technical descriptions of a number of important and promising hybrids, four of which are shown in color.

**A morphological study of gladiolus,** N. E. Pfeiffer (*Contrib. Boyce Thompson Inst., 3 (1931), No. 2, pp. 173–195, pls. 3, figs. 7*).—The results are presented of a technical study upon the growth and development of the gladiolus plant, taking into consideration both the vegetative and reproductive stages.

## FORESTRY

**Relation of forest site quality to number of plant individuals per unit area,** H. J. Lutz (*Jour. Forestry, 30 (1932), No. 1, pp. 34–38*).—Once competition begins good forest sites, due to the larger size of trees and earlier expression of dominance, usually support fewer trees per acre than do poor sites. Up to the onset of competition more trees are found on the better soil. There were more shrubs and herbs per unit area on the good than on the poor sites, due apparently to better moisture and nutritive conditions.

**Fertilizing coniferous seedlings, A. C. McIntyre and J. W. White** (*Jour. Amer. Soc. Agron., 24 (1932), No. 1, pp. 72, 73*).—As determined by average weights recorded at the end of the second and fourth years, fertilizers exerted material influence on the growth of pitch pine (*Pinus rigida*) seedlings growing at the Pennsylvania Experiment Station. However, it was apparent from the changes in relative rank from the second to the fourth year that varying responses may be expected according to the duration of the experiment, a situation apparently due to the slow dissolving of certain substances or to the gradual loss of toxicity of others. Dried blood at the rate of 400 lbs. per acre was the leading treatment in both years. Soil reaction determinations showed greater acidity on the ammonium sulfate than on the nitrate of soda plats, and in general indicated that fertilizers had influenced the soil reaction.

**Stimulation of root growth on cuttings from hardwood forest trees, G. C. Hutchings and J. A. Larsen** (*Iowa Acad. Sci. Proc., 36 (1929), pp. 191–200*).—Cuttings of the current season's growth of green ash, soft maple, basswood, and Carolina poplar were taken at the Iowa State College in late November, buried in a storage pit, and brought into the greenhouse in February, where after immersion in weak solutions of acetic acid, potassium permanganate, sucrose, and thiourea they were planted. The highest percentage of rooting in the case of green ash was secured from the acetic acid treatment, in soft maple from potassium permanganate, while poplar rooted freely in all solutions except the thiourea, which gave negative results with all four species. Basswood failed to root at all. Except in the case of the easy rooting poplar, sucrose was apparently harmful. In another experiment white oak cuttings failed to respond to any treatment.

**Variation in characteristics of black locust seeds from two regions, C. L. Burton** (*Jour. Forestry, 30 (1932), No. 1, pp. 29–33*).—Germination tests of Idaho and Austrian grown black locust seeds soaked for 10 minutes in a 0.25 per cent Semesan solution and sown in sterilized soil showed somewhat greater viability for the Austrian seed. Treating seed with hot water (170° F.) increased the germination of Austrian seed by 23 to 51 per cent but had little effect on the Idaho seed. Scarification was beneficial to both lots, but when followed by hot water scarification killed practically all seeds. Sulfuric acid was particularly harmful to Austrian seed, the coats of which were evidently softer and more permeable than those of the Idaho seed. The best treatment for Idaho locust seed was scarification and for Austrian seed hot water immersion.

**The effect of black locust on soil nitrogen and growth of catalpa, A. C. McIntyre and C. D. Jeffries** (*Jour. Forestry, 30 (1932), No. 1, pp. 22–28, fig. 1*).—Measurements taken at the Pennsylvania Experiment Station on the growth of catalpa trees planted adjacent to black locusts showed a significant and progressive decrease in the growth of catalpa as the distance from the locust was increased. Nitrate nitrogen determinations showed considerably more in the soil in the locust area and in the catalpa near the locust than at some distance. It was apparent that black locust increased the total nitrogen ratio in the soil and thus stimulated the growth of the catalpa.

**A note on Jeffrey and western yellow pine, N. T. Mirov** (*Jour. Forestry, 30 (1932), No. 1, pp. 93, 94*).—Pointing out that the Jeffrey pine (*Pinus jeffreyi*) and the western yellow pine (*P. ponderosa*), although closely related botanically, differ considerably in respect to biochemical characters, the author reports finding a yellow pine the oleoresin of which was quite intermediate in character between that of the two species. A second tree, evidently a natural graft, yielded typical Jeffrey pine heptane oleoresin from its Jeffrey side and oleoresin from its western yellow pine side.

**Planting black walnut,** W. R. Mattoon and C. A. Reed (*U. S. Dept. Agr. Leaflet 84 (1932), pp. 8, figs. 4*).—Brief, concise instructions are presented for the gathering and handling of black walnuts and for growing and planting the seedlings.

**Releasing merchantable-sized spruce and fir through girdling,** M. Westveld (*Jour. Forestry, 30 (1932), No. 1, pp. 94, 95*).—Girdling of all the hardwoods in a mixed stand near Patten, Me., down to 2 in. diameter, thereby releasing 40 spruce and fir per acre with an average diameter of 8 in., increased the yield of merchantable pulpwood obtained 11 years later by 6.7 cords and netted the owner a profit of $2 per acre per year. It is estimated that sufficient growth increase was obtained in the first 2 years following girdling to pay costs.

**Felling, girdling, and poisoning undesirable trees in forest stands,** A. L. MacKinney and C. F. Korstian (*Jour. Forestry, 30 (1932), No. 2, pp. 169–177, figs. 4*).—Comparisons made by the U. S. D. A. Appalachian Forest Experiment Station of sodium arsenite poisoning, girdling, and felling as a means of eliminating undesirable trees from the forest indicated that poisoning is the cheapest, quickest, and most desirable method. Poisoned trees did not sprout as freely as girdled or felled trees, and with all three treatments the larger the tree the less the tendency to sprout. Trees girdled or poisoned close to the ground sprouted less than those girdled or poisoned higher up the trunk.

## DISEASES OF PLANTS

**Pathology of the plant cell.—I, Pathology of protoplasm,** E. Küster (*Pathologie der Pflanzenzelle. Teil I, Pathologie des Protoplasmas. Berlin: Borntraeger Bros., 1929, pt. 1, pp. VIII+200, figs. 36*).—This is part 1 of volume 3 of the series of monographs on protoplasm, the first volume of which, by Heilbrunn, has been noted (E. S. R., 62, p. 309). The first part of the present book deals generally with changes in form, and the second with changes in structure.

**The active acidity of the cell sap of some plants and their susceptibility to fungus and bacterial infection** [trans. title], A. T. Tropova (*Izv. Opytn. Sev. Kavkaza (Jour. Agr. Research North Caucasus), No. 13 (1929), pp. 3–16; Eng. abs., p. 344*).—From work carried on at the North Caucasian Regional Agricultural Experiment Station in 1928 seeking correlation between the degree of susceptibility to fungus infection and H-ion concentration in the cell sap, the author concludes that the active acidity of a given plant is not the same throughout the various organs, and that this condition apppears to determine in part the adaptation of the parasite as to the occurrence or degree of attack on these parts separately. *Fusarium ricini*, for example, infects only the cluster of the castor bean plant. Different varieties and forms show differing acidity as to cell sap. In natural as in artificial environment the susceptibility of the castor bean plant to *F. ricini* varies in connection with the pH value of the cell sap. The moment of infection corresponds to the attainment of a given pH value. The percentage of infection by fungi or bacteria varies in connection with variation in pH. Vigorous development is favored in some attacking microorganisms by an acid, in others by an alkaline condition. In the selection, therefore, of plant varieties for resistance, the value of the pH of the cell sap should be taken into consideration as a factor. This may require consideration of external conditions (as fertilizers, soil type) which do or may influence the pH of the cell sap and thereby the degree of infection by given fungi.

**Concerning the reaction of certain fungi to various wave lengths of light,** C. L. Porter and H. W. Bockstahler (*Ind. Acad. Sci. Proc., 44 (1928),* *pp. 133–135*).—In work on a two-phase problem dealing, respectively, on the one hand with the growth of fungi in continuous light, continuous darkness, and alternate light and darkness, and on the other with the growth of cultures under continuous illumination through spectrally pure glass (Cambosco) filters, observations were made concerning rate of growth, spore production, hyphal modifications, changes in color, and zoning. This work showed that fungi may be made to vary in spore production and vegetative growth with changes in the quality and the intensity of the light. The results have since been elaborated by Cooper and Porter in the article noted on page 842.

The present account merely outlines the work in its main phases and bearings as to the effect of various wave lengths of light confined to the visible spectrum and the effect of the extremely short and nonvisible radiations of the ultra-violet. It is concluded that fungi are extremely sensitive to light changes. The quality as well as the quantity of the light affects the growth and development of fungi. Ultra-violet wave lengths cause greater material changes than do those of the visible spectrum. Though the ultra-violet affects the aspect of colonial development, the actual killing effect is not marked.

**Blind plants** [trans. title], K. Schilberszky (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 9–10, pp. 276–279, fig. 1*).—The author presents the name "blind plantlets" as appropriate to certain herbivorous plants in which, with complete suppression of the terminal bud, the last formed leaf places itself upright and develops enormously, so as to present a striking giantism, involving the widening, lengthening, and thickening of the leaf as a whole with hypertrophy of the mesophyll. In one garden collection, 35 per cent of the seed used gave these so-called blind plants. Besides cauliflower, kohlrabi, cabbage, and less often Brussels sprouts, are affected. Destruction of the bud due to insect injury is excluded in cases indicated. Partial atrophy in blooms occurs in numerous cases.

**Two new fungi discovered in the Province of North Dvina** [trans. title], B. Roters (Rothers) (*Zashch. Rast. Vred.* (*Plant Protect.*), [*Leningrad*], *6 (1929), No. 1–2, pp. 233, 234*).—The author presents a description of *Ascochyta* (*Stagonosporopsis*) *sedi-purpurei* n. sp., found on the living leaves of *Sedum purpureum*, and of *Gloeosporium trifoliorum* n. sp., found on living leaves of *Trifolium pratense*. The cultural characters of the fungi are detailed in Latin.

**Diseases of small grain crops**, A. W. Henry (*Alberta Univ., Col. Agr. Bul. 18 (1928), pp. 78, figs. 23*).—Information is presented in systematic form to include the principal diseases of wheat, oats, barley, rye, and flax, and their seed treatments with formalin, copper carbonate dust, and hot water. General recommendations emphasize careful seed selection, cleaning, and treatment with disinfectants; early seeding in well-prepared ground; rotation; resistant varieties; destruction of wild hosts; and avoidance of suspected manure or straw.

**Susceptibility of cereals to rust** [trans. title], G. Potenza (*Bari Staz. Agr. Sper. Pub. 12 (1928), pp. [1]+1–68, pls. 8*).—Conditions detailed as found favorable to attack by wheat yellow rust (*Puccinia glumarum tritici*) include soil humidity of 15 per cent or higher, water drops on the leaves, temperature not higher than 5° C. (41° F.), open stomata, and high sugar content in the leaves. These conditions are more likely to coincide during quiet days of March and April. For blade rust (*P. graminis tritici*) the favoring conditions are high humidity of the air, calmness, and temperature below 15°. For attack by crown rust of oats (*P. lolii avenae*), the conditions in general resemble those for wheat yellow rust, but the favoring temperature is somewhat lower. The conditions for black sheath rust of oats (*P. graminis avenae*) resemble those for black rust of wheat.

Plants not manured are attacked later. Crown rust in oats is always the more severe the later the crop is furnished with assimilable nitrogen.

Irrigation by way of superficial canals has increased rust infection. Subirrigation had no such effect. The relation to attack of precocity or of its opposite, late development, is discussed, as are also the differences and variations that can be noted from year to year in a given place as regards the susceptibility of strains to infection.

**Dissemination of "powdery mildews" of cereals, K. C. Mehta** (*Indian Sci. Cong. Proc.* [*Calcutta*], *17* (*1930*), *p. 282*).—It is noted that powdery mildews of wheat and barley can survive the summer in the hills as do the rusts. *Erysiphe graminis* on both can be successfully cultivated on the plains during the winter, but it dies of heat late in April. Erysiphe material capable of producing infection is available in the hills during the "critical period." A severe attack of Erysiphe on wheat was noted at Allahabad in the previous winter. As Erysiphe occurs during the summer in the hills under conditions similar to those for cereal rusts, it is suggested that they are disseminated to the plains in like manner. Oidia so carried by wind may produce an epidemic in the case of damp weather.

**Localization of resistance to powdery mildew in the barley plant, J. R. Mackie** (*Phytopathology, 18* (*1928*), *No. 11, pp. 901–910, figs. 3*).—During the course of investigations seeking to delimit more definitely the features of varietal resistance of barleys to powdery mildew and to ascertain the causes of this resistance for use in breeding and selection, it appeared that susceptibility of a barley variety to a given suitable physiological form of mildew was fairly constant under the conditions of culture. No mean morphological differences were made out between varieties differing in susceptibility to a given mildew strain.

Host-tissue injury (removal of epidermis) in all cases but one reduced host resistance and allowed at least subinfection. Exposed mesophyll showed no resistance. Penetration of the infection threads appeared normal. No entrance of stomata was observed.

The varietal resistances observed, as graded to scale, ranged as follows: Sacramento 0°, Goldfoil 0°, Common Chile 0° to 1°, Chile 1° to 3°, Oderbrucker 2° to 4°, Hero 3° to 4°, Hanna 4°, and Atlas 4°.

It is thought that the resistance of a barley variety may be quite stable toward the given physiological form of mildew under these conditions. "It seems possible then, for any given locality, to obtain a variety of barley which under ordinary conditions will be immune to *Erysiphe graminis*. This resistance may be altered by circumstances affecting the vitality of the host tissue, such as a mechanical injury. It appears unlikely that this 'xenoparasitism' would be able to cause the general infection of an immune variety."

**Heterothallism and hybridization in Tilletia tritici and T. levis, H. H. Flor** (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 1, pp. 49–58*).—Three physiologic forms were found in the 20 cultures of *T. tritici* and two in the nine cultures of *T. levis*, the pathogenicity of which was studied by the U. S. Department of Agriculture. Prelude wheat inoculated with the single cultures was not smutted, but the pairing of two sexually compatible cultures caused normal infection. The monosporidial cultures or lines belong to a number of sex groups, the respective members of which are specific in their activity, as in no instance was a member of one sexually compatible group able to cause infection when paired with a member of another such group. The pairing of a monosporidial culture of *T. tritici* with a *T. levis* culture of the opposite sex caused smutting of wheat seedlings. Monosporidial cultures of three forms of *T. tritici* and two forms of *T. levis* were found to belong to the same sex group, and the spores produced by this species cross were identical in appearance with those of *T. levis*. It is believed that pathogenically pure lines of *T. tritici* and of *T. levis* can be developed by the proper pairing of monosporidial cultures.

**Varietal susceptibility of grains to rust** [trans. title], S. VERDESCA (*Bari Staz. Agr. Sper. Pub. 15 (1929), pp.* [2]+*1–49*).—The attempt is made to tabulate, within the limits of a scale of seven main conditions or combinations as defined, the resistance or receptivity of grains (Triticum species and varieties) for the rusts, yellow, brown, and black.

**Control of bunt of wheat in Nebraska,** G. L. PELTIER (*Phytopathology, 18 (1928), No. 11, pp. 921–929*).—In order to determine what factors cause the variation in results from the use of copper carbonate dusts for wheat seed disinfectants in Nebraska, tests were begun in 1923 and continued through 1927 at the station farm at Lincoln and at the North Platte Substation, the seed employed being Nebraska No. 60, a very uniform strain of Turkey.

Formaldehyde, the most effective treatment under all conditions, gave a consistently lower germination. With this exception, no appreciable differences were noted with any of the dust treatments as regards germination, stimulation, and winter survival. The most effective dust was copper carbonate (2 oz. per bushel), Corona Copper Carb ranking slightly lower. The effectiveness of all treatments appeared to be lessened under environmental conditions favoring maximum bunt infection. Treated seed should be sown as near as possible to the normal planting date for the locality.

**Copper-containing fungicidal dusts** [trans. title], F. X. SCHWAEBEL (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 3, pp. 113–117, figs. 2*).—Reviewing in part, briefly, the use of a copper-containing dust as a fungicide during nearly 30 years, the author reports in tabular form the fungicidal use of several copper preparations, emphasizing the effectiveness of a dry copper salt preparation for controlling wheat stinking smut, promoting growth without lowering germinability.

**Secondary effects of corrosive fungicides** [trans. title], A. NIETHAMMER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 3–4, pp. 83–87*).—As the outcome of experimentation of which the present brief account is given, it is claimed that a stimulating effect on the germination of wheat seed grain has been produced by the application thereto of commercial disinfectants named.

**Rhizoctonia on asparagus** [trans. title], J. VERCIER (*Rev. Hort. [Paris], 101 (1929), No. 22, pp. 550, 551*).—*R. violacea* is dealt with in its relation to a rot of asparagus and briefly in its relations to other hosts, with an outline of five kinds of treatments.

**Investigations in the mosaic disease of bean (Phaseolus vulgaris L.),** R. NELSON (*Michigan Sta. Tech. Bul. 118 (1932), pp. 71, pls. 11*).—Describing in detail the symptoms of mosaic in the navy pea and Refugee beans, varieties of high susceptibility, the author suggests that the manner in which the symptoms develop in some plants grown from infected seed indicates that the causal agent is more or less localized in its distribution and movement through the plant, apparently moving through the vascular tissues, presumably the phloem.

Bean mosaic was not found highly infectious like tobacco mosaic and was transmitted artificially with more or less difficulty. Bean leafhoppers were present in large numbers in years of rapid mosaic spread, but transmission was not accomplished by this insect as it was by the potato aphis.

Concerning seed infection, about one-half of the plants grown from infected seed showed the virus, and no evidence was obtained that the position of the seed in the pod had any influence on infection. Plants infected after flowering rarely transmitted the virus to the seed. With the exception of Robust, all important varieties were found susceptible.

Organisms were observed in the lytic areas of the chloroplasts in the cortical parenchyma of the petioles and also in the leaf parenchyma cells of mosaic plants. At the same time no similar organisms were observed in normal chloroplasts. The organisms occur in affected cells as single or paired cocci. Enormous numbers of extremely small, round, or coccoid bodies were sometimes observed in the chloroplasts in the leaf parenchyma of mosaic plants, and similar bodies were observed in the border parenchyma cells of the phloem and xylem. Similar bodies were isolated repeatedly both from the tissues of mosaic plants and from young seeds produced on mosaic plants.

Rugose mosaic, found only on the Refugee bean, is believed distinct from the true mosaic. An extremely pleomorphic organism was observed in the chloroplasts of leaflets and also isolated from the seed of rugose mosaic affected Refugee plants. Small bodies similar to those seen in the chloroplasts of plants affected with true mosaic were observed in the living chloroplasts of rugose mosaic plants. Cocci and bacterium-like organisms resembling the Rickettsiae were cultured from plants affected with rugose mosaic. Inoculation of the cocci isolated from plants affected with true mosaic or of the pleomorphic organism from plants affected with rugose mosaic did not result in the development of mosaic.

**Bottom rot and related diseases of cabbage caused by Corticium vagum B. & C.,** G. F. Weber (*Florida Sta. Bul. 242 (1931), pp. 31, figs. 15*).—A bottom rot disease causing considerable loss in Florida cabbage fields in 1929–30 is ascribed to the Rhizoctonia stage of *C. vagum*. The heads were attacked from below, the fungus apparently climbing the stem from the soil. The disease is described in detail, and its relations to other diseases of cabbage caused by the same parasite are discussed. The perfect stage of the fungus (*R. solani*) was collected in nature and reproduced by artificial inoculation under controlled conditions. Basidiospores of the perfect stage were germinated in pure cultures and the imperfect stage produced. Cultures from *R. solani* and from the basidiospores of *C. vagum* were indistinguishable, and both induced bottom rot symptoms comparable to those observed in the field.

Absolute control of the disease is deemed practically impossible in Florida because of the wide distribution of the organism in the soils. Seed bed sterilization is recommended in order to produce disease-free plants for the field setting, and a system of culture should be followed which does not bank the soil too close to the plants. Healthy seedlings do not always become infected when set out in disease-infested soils.

**Results of seed-treatment experiments with yellow dent corn,** J. R. Holbert and B. Koehler (*U. S. Dept. Agr., Tech. Bul. 260 (1931), pp. 64, pls. 2, figs. 19*).—Investigations conducted in cooperation with the Illinois Experiment Station and extending over a period of 11 years lead to the general statement that seed treatment is an effective means of guarding against such losses as result from seed-borne infections and soil-borne diseases that adversely affect corn plants during their seedling stage. Dust disinfectants were found effective for such infections of Diplodia and Gibberella as occurred in well-selected lots of seed, and also aided in controlling other seed-borne diseases and offered some protection against soil-borne diseases.

Seed treatment was usually followed by better stands and increased early vegetative growth, and occasionally the corn grown from treated seed displayed somewhat greater resistance to lodging. Ear rots were slightly reduced by the use of seed treatment. The yield of corn grown from farmer's seed was increased by about 3 bu. per acre as a result of dusting with some of the more effective materials. The more important seed-borne diseases and their effect on the corn plant are discussed in some detail.

**Root constriction of cotton plants in the San Joaquin Valley of California**, J. W. Hubbard (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 1*, *pp. 39–47*, *figs. 5*).—Observations at the U. S. Department of Agriculture cotton field station at Shafter, Calif., showed that constriction of taproots was general in plats that were not irrigated for a considerable time after planting. The soil was a light sandy loam that became very hard when dry. Irrigation corrected the condition to the extent that plants that were not too severely injured recovered after irrigation and developed normally. Following irrigation, affected plants developed lateral roots which 11 days after irrigation had become of considerable length, well branched, and sturdy.

Observations of the cross sections of the constricted roots made during the period of rapid growth following irrigation showed a large ring of semitransparent wood tissue between the old wood and the bark. Six days after irrigation this could be scraped off into a clear, jellylike mass, and after 11 days no lines of demarcation were perceptible to the naked eye between the new and the old wood.

**The cotton root rot fungus indigenous in Arizona deserts**, C. J. King, C. Hope, and E. D. Eaton (*Science*, *75* (*1932*), *No. 1932*, *pp. 48*, *49*).—Recent studies in Texas and Arizona are said to indicate that the cotton root rot fungus (*Phymatotrichum omnivorum*) is indigenous in virgin lands in the Southwest. An examination of desert vegetation at a distance of about 12 miles from any cultivated fields in the vicinity of Florence, Ariz., showed the presence of typical fungus strands and distinct lesions on the roots of *Chamaesyce albomarginata*, *Aplopappus heterophyllus*, and *Sphaeralcea ambigua*. The mycelium was observed on the roots of several other species of desert plants, but no lesions or rotted tissues were found. Viable sclerotia were found in soil near mats of the fungus.

The occurrence of the fungus in virgin lands is thought to explain the occasional occurrence of root rot on cultivated crops planted after the clearing of the native vegetation.

**Cotton wilt studies.—III, The behavior of certain cotton varieties grown on soil artificially infested with the cotton wilt organism**, J. O. Ware, V. H. Young, and G. Janssen (*Arkansas Sta. Bul. 269* (*1932*), *pp. 51*, *figs. 2*).—Presenting a further report (E. S. R., 61, p. 536) upon long continued studies, the authors state that wilt susceptibility and earliness appeared in several varieties to be correlated. However, early varieties were not always highly susceptible nor were late varieties largely immune. Wilt resistance was apparently not associated with such characters as lint percentage, staple length, boll size, seed size, lint index, or seed per lock.

A high lint percentage may be the result of light or faulty seed rather than an abundance of lint. High lint yield was, however, in general associated with large and heavy seed. Large locks were associated with high lint index or with an abundance of lint per seed, but staple length did not appear to be associated with lint yield.

Arkansas 17, D. & P. L. 6, and Lightning Express are suggested as desirable staple varieties for growing on wilt-infested soils of the bottom or delta types. Super Seven, Miller, and Arkansas Rowden 40 are intermediate staple types recommended for the same soils. For upland soils infested with wilt the intermediate staple varieties Miller and Arkansas Rowden 40 are recommended, and for either wilt-infested bottom or upland soils, Dixie Triumph and Dixie

14 are suggested. Various other varieties were found satisfactory for moderately infested soils. Small percentages of wilt infection did not materially affect yield, but larger infections did reduce yields.

**Parodiella spegazzinii,** K. B. Boedijn (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 5–6, pp. 129–132, figs. 4*).—A brief descriptive account is given of some drawbacks to the culture of legumes recently introduced as plants for green manure, particularly of tea, into Sumatra. The species of these plants most studied are *Crotalaria usaramoensis*, *C. striata*, and *C. anagyroides*. Of these, the first is considerably, the second to some extent injured by the leaf-inhabiting ascomycete *P. spegazzinii*, which has been known to kill plants in many instances.

**The effect of seed disinfectants on smut and on yield of millet,** R. H. Porter, T. F. Yu, and H. K. Chen (*Phytopathology, 18 (1928), No. 11, pp. 911–919*).—Millet (*Setaria italica*), a major crop in the northern and northeastern provinces of China and in Manchuria, was shown by surveys in 1925 and in 1926 to be limited as to production by kernel smut (*Ustilago crameri*), infection rates ranging from 10 to 25 per cent and even to 50 per cent.

Tests carried on in 1926 and 1927 on nearly smut-free and on badly smutted millet seed with formaldehyde, dry Uspulun, copper carbonate, and dry Tillantin B were all about equally effective, though none reduced infection below 2.6 per cent. The checks averaged 26.6 per cent in 1926 and 20.6 per cent in 1927. Uspulun solution gave poor control.

Dry Tillantin B, Uspulun, Tillantin-Trockenbeize, Tillantin-Naszbeize, and liquid Uspulun and Tillantin-Höchst reduced smut to less than 1 per cent in comparison with 6.8 per cent smut on untreated, artificially smutted seed.

On badly infected seed all of the treatments used increased the yield, these increases ranging from 1.7 to 11.7 bu. per acre, depending on the fertility of the soil and the treatment used. Dry Uspulun and Tillantin B gave yield increases consistently larger than that due to copper carbonate.

Smut-free heads selected before harvest from a field badly infected with smut gave a crop having 4.7 per cent smut, which was 26.2 per cent less than the smut in the crop produced by seed from the same field collected after threshing. The increase in yield from seed of selected heads was 26.6 per cent.

It is thought that where a small acreage is planted on each farm, as in China, head selection before harvest in combination with seed treatment should prove profitable.

**Onion spraying and dusting experiments,** W. L. Doran and A. I. Bourne (*Massachusetts Sta. Bul. 279 (1931), pp. 175–185*).—In field experiments conducted in 1929, 1930, and 1931, onions were injured by copper-lime dust in two of the three years, and the loss caused by blast disease was not lessened. On the other hand, 4–4–50 and 8–4–50 Bordeaux mixtures were not injurious to onions when applied with proper equipment at a pressure of from 100 to 150 lbs. Yields of onions were increased somewhat by spraying with Bordeaux mixture when downy mildew and blast were not present. Milk of lime was less effective than Bordeaux mixture. The onset of blast was delayed but not prevented by Bordeaux mixture, and in a year of blast disease yields were increased the most by four weekly applications of 4–4–50 Bordeaux mixture.

From the results obtained the authors conclude that increases in yield from the use of Bordeaux mixture were not large enough to justify spraying onions every year with a copper fungicide alone. However, it is suggested that growers spraying onions with nicotine sulfate for protection against thrips include Bordeaux mixture in the combination spray.

**[Pea diseases at the Alabama Station]** (*Alabama Sta. Rpt. 1931, pp. 46, 47*).—Although Oregon grown pea seed showed only 0.03 per cent of Mycosphaerella and Ascochyta infection as compared with 8 per cent for local grown seed, J. L. Seal reports that there were about equal amounts of disease present in adjacent plantings toward the close of the growing season, indicating that small initial infections may result in abundant disease later on. None of the 40 seed treatments tested proved of any value, apparently because of the presence of the disease on old plant refuse in the soil. Steam sterilization of the soil from a badly infested field resulted in a disease-free stand of plants. Nematodes, Rhizoctonia, and lack of inoculation all caused considerable injury to peas.

**The running out of potato varieties** [trans. title], W. SCHWARTZ (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 7–8, pp. 216–221*).—Defining "abbau" as a progresssive lowering of the crop return from a cultivated plant, and citing literature dealing with this and supposedly causal, related, or associated phenomena, the author describes this tendency as occurring in relation with certain conditions indicated.

**A study of the physiologic forms of kernel smut (Sphacelotheca sorghi) of sorghum,** L. E. MELCHERS, C. H. FICKE, and C. O. JOHNSTON (*Jour. Agr. Research* [*U. S.*], *44 (1932), No. 1, pp. 1–11, figs. 2*).—In this cooperative study between the U. S. Department of Agriculture and the Kansas Experiment Station, a total of 80 sorghums were inoculated with five physiologic forms of kernel smut. Varieties such as durra, milo, selections of feterita, darso, Dwarf hegari, and White Yolo, formerly recognized as immune, were found somewhat susceptible to one or more physiologic forms. One selection of Spur feterita and three Red Amber × feterita hybrids proved immune to all five forms of smut. There were no outstanding morphological differences between the chlamydospores of the five physiologic forms of kernel smut. The occurrence of physiologic forms of smut that attack hitherto resistant or immune sorghums is said to have greatly increased the difficulty in breeding varieties of sorghum resistant to kernel smut. All of the five forms of kernel smut under test were controlled by copper carbonate dust seed treatment.

**Effect of temperature on rate of decay of sugar beets by strains of Phoma betae,** C. M. TOMPKINS and D. A. PACK (*Jour. Agr. Research* [*U. S.*], *44 (1932), No. 1, pp. 29–37, figs. 2*).—Studies by the U. S. Department of Agriculture on the relative rate of decay of sugar beets as induced by four isolations of *P. betae* under controlled temperature conditions and on the relation of temperature and storage period to the quantitative effects of each form as a producer of decay showed definite differences. Between two of the four strains there were found distinct morphological differences. Differences as great as 50 per cent were noted in the rates of destruction of beet tissue but varied with temperature and the length of the storage period. Increased storage temperature increased the metabolic activity of the fungus with attendant increase in decay, the differences being significant for each 5° C. change. The differences between the strains were such as to lead the authors to conclude that distinct strains of *P. betae* exist.

**Development of storage diseases in sugar beets resulting from hook injury,** C. M. TOMPKINS and S. B. NUCKOLS (*Phytopathology, 18 (1928), No. 11, pp. 939–941, figs. 2*).—This paper is concerned particularly with wound injury resulting from the use of the hooked beet-topping knife, said to cause wounds which, during the storage period (25 to 40 days or longer), cause decay loss amounting to from 15 to 25 per cent of the total in weight and sugar taken together.

Numerous isolations from diseased beets indicate that *Phoma betae* is the principal rotting wound parasite, though several species of Fusarium also become parasitic in the presence of wound tissue exposure.

It is recommended that the use of the hooked knife be stopped and the Colorado system of harvesting (as described) be substituted.

**Wildfire a new tobacco disease in Bulgaria,** P. Pateff (*Izv. B''lgarsk. Bot. Druzh.* (*Bul. Soc. Bot. Bulgarie*), *2* (*1928*), *pp. 39–42*).—In 1923 a leaf spot disease of tobacco, which proved on careful examination to be that designated in America as wildfire, broke out and spread destructively in all tobacco-growing districts of Bulgaria. The disease is supposed to have been present in the region for some years. Notations are given for other countries. Both morphological and cultural characters are detailed.

**Fruit scab control experimentation in northern Bohemia** [trans. title], F. Zimmermann (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38* (*1928*), *No. 7–8, pp. 208–215*).—In one of the important fruit regions of Europe, producing largely apples, pears, cherries, and plums, scurf and scabbing diseases, in connection with which are indicated *Fusicladium dedriticum* on apples and *Nectria galligena* on pears, cause considerable loss by lowering grades for market. Averaged results are tabulated, with discussion, of tests with the fungicides Solbar and Nosprasen.

**Bitter pit in apples: Some recent investigations,** W. M. Carne (*Jour. Council Sci. and Indus. Research* [*Aust.*], *1* (*1928*), *No. 6, pp. 358–365*).—Prefacing his report of work, said to have been carried on by himself with aid from H. Elliott and H. A. Pittman, with a brief historical review, the author advances the view that bitter pit is due to the picking of the fruit in an immature condition, and reports work carried on during the 1928 season.

He concludes that bitter pit in apples occurs principally, if not entirely, after picking. Of the many varieties affected, the most susceptible, apparently, of the principal export varieties, are Cox Orange Pippin, Ribston Pippin, Cleopatra, Sturmer Pippin, Dunn, and Granny Smith. Cork, particularly the form blotchy cork, is the disease formerly known as bitter pit developing on apples while still on the trees. In these experiments, it was found principally in Cleopatra, Spitzenberg, Five Crown, Sturmer Pippin, Newtown Pippin, and French Crab, but also on many other varieties. Jonathan spot is a superficial spot, noted principally on Jonathan and Spitzenberg, but also on Yates and other varieties

It is claimed that picking apples for export later in the season than has been usual will not only reduce bitter pit but will also improve appearance and flavor. The proper stage for picking varieties susceptible to bitter pit can be ascertained by testing them with iodine immediately after picking. Practical suggestions are made as to the application of these findings to commercial practice.

**A cherry tree disease** [trans. title], P. Passy (*Rev. Hort.* [*Paris*], *100* (*1928*), *No. 1, pp. 21, 22, fig. 1*).—The author describes the effects of attacks on cherry trees by *Clasterosporium carpophilum*. The effects of the fungus on leaves and young fruits are described. Considerable damage is said to be caused by this parasite in Switzerland. The treatments briefly presented include the application in March to the trees of carbolineum (8 to 10 per cent in water), lime-sulfur, and Bordeaux mixture.

**Endosepsis and its control in caprifigs,** H. N. Hansen (*Phytopathology, 18* (*1928*), *No. 11, pp. 931–938, figs. 2*).—Endosepsis, affecting caprifigs in California, has assumed alarming proportions in recent years. The rapid increase and spread of the disease, due to *Fusarium moniliforme fici* and carried by the caprifying insect *Blastophaga psenes*, are attributed to the practice of intersectional distribution of caprifigs, the prolific nature of the insect, and its ability to fly long distances.

Both laboratory and field experiments are said to indicate that the causal organism may be eliminated from caprifigs either by injecting a fungicide (2 per cent Semesan) into young caprifigs (mamme) or by cutting mature ones into halves and dipping them for 15 minutes into the fungicide.

**Bunchy top in bananas**, E. J. GODDARD (*Jour. Council Sci. and Indus. Research* [*Aust.*], *2* (*1929*), *No. 1, pp. 21–27*).—Continuing earlier work (E. S. R., 60, p. 451), an attempt is made to set forth in condensed form the present knowledge of the banana bunchy top disease and of means for at least a considerable measure of control. "It has been found possible to locate the site of the first occurrence of bunchy top in Australia, and to learn that from that plantation to which diseased plants were brought from Fiji, where bunchy top has occurred since 1885, the disease was distributed directly by the shifting of suckers to other plantations. Undoubtedly this direct means of spreading the disease is assisted by the aphid [*Pentalonia nigronervosa*]."

In the past three years, much attention has been devoted to the life history of the aphid, particularly its migration. The aphids commonly occur massed or as colonies in the heart or crown, where both food and shelter are adequate. Though these colonies consist through most of the year of wingless females, winged migrating forms arise at certain times, and these show a tendency to ascend persistently, this fact suggesting their utilization of ascending air currents in their migratory distribution. Individuals may maintain themselves on the wing for more than four hours, so that a breeze could carry them forward. Isolated areas of infection have shown, when investigated, strong down currents varying as to position at different times of the year.

There are two associations of aphids, and each of these is double brooded. "Winged forms are abundant during September, and when such forms settle on banana plants they give rise to colonies, the members of which go on reproducing wingless forms for a period of about five months. At intervals, winged forms arise from such colonies in very small numbers throughout the period of existence, but the big and ultimate appearance of winged forms takes place at the end of January and the beginning of February. From the latter will arise the colonies destined again during the following September to provide a migratory host. The second association is responsible for winged forms during the latter part of November and the early part of December. They result in colonies which, while giving rise at intervals to a few winged forms, will provide the biggest winged migration of the year at the end of March and the beginning of April.

"Careful analysis indicates that the times of rapid spread of bunchy top can be coordinated with the maximum winged migration of aphids during September, November-December, January-February, March-April. There are practically no winged forms during the months of June and July, and there is a marked paucity during the latter part of May and the early part of August. In any attempt to adopt protective measures, these periods would be of the greatest use."

Experiments carried out with kerosene emulsion and Blackleaf 40 gave evident results, but these measures are not of first importance. The suggestions detailed recognize the regulations in force, as well as the efficiency of these as carried out. Field experience during the past three years indicates that "provided the necessary effort is made by all concerned, bunchy top can be eradicated."

**Further citrus canker studies,** E. M. Doidge (*Union So. Africa Dept. Agr. Bul. 51 (1929), pp. 31, fig. 1*).—In 1917, a campaign against citrus canker was decided upon as noted by Evans and by Doidge (E. S. R., 45, p. 751). Information regarding some of the work is tabulated in the present account, and phases and results of its continuation are also given in some detail, including tabulations.

**Mosaic disease of flower bulb plants,** D. Atanasoff (*Izv. B''lgarsk. Bot. Druzh. (Bul. Soc. Bot. Bulgarie), 2 (1928), pp. 51–60, pls. 3*).—Listing flower bulb plants previously reported as subject to mosaic, the author also lists plants presenting mosaic as observed by himself, including tulips, hyacinths, narcissus, lilies, crocus, *Muscari comosum*, *M. comosum campactum*, *M. botryoides*, *Iris hispanica*, *Nerine sarniensis*, *Allium neapolitanum*, and *A. moly*. It is stated that little is known of the geographic distribution of the disease.

Measures referred to for combating this disease or condition include strict exclusion of all suspicious plants, early lifting of the bulbs to shorten the period of exposure to infection, and fumigation to destroy insect carriers. The hot water treatment (43° to 44° C. for 4 hours) said to have given good results in controlling nematode disease in bulb plants, did not kill the virus of the mosaic.

**A leaf spot or blight disease of Ricinus communis L., caused by Macrosporium ricini** [trans. title], H. Yoshii (*Bul. Sci. Fakult. Terkult., Kjusu Imp. Univ., Fukuoka, Japan., 3 (1929), No. 4, pp. 327–332, pl. 1; Eng. abs., p. 332*).—This paper deals with a leaf spot or blight of the castor oil plant (*R. communis*), characterized by an irregular cinnamon buff spot from 10 to 20 mm. in diameter, variegated with irregular tawny olive zones and often surrounded by a halo of etiolation. A brief description is given of the causal fungus, which is described as a new species and named *M. ricini*. The organism was collected at Suigen, Chosen, in 1926 and 1927 and at Hakozaki, Fukuoka, in 1928. The parasitic nature of the fungus has been established by successful inoculations upon the leaves of castor oil plants.

**Mildew** [trans. title], S. Blumer (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 3–4, pp. 78–83, figs. 3*).—In recent years *Hydrangea hortensis* in Switzerland has been severely injured owing to attacks by a fungus, allegedly an Oidium, the exact specific position of which is regarded as unsettled.

Outstanding results in its control are said to have been obtained by use of Sulfosan, a proprietary sulfur preparation.

**Leaf rot of Nymphaea alba** [trans. title], J. Grüss (*Centbl. Bakt.* [etc.], *2 Abt., 74 (1928), No. 8–14, pp. 214–229, figs. 19*).—In 1927, the author discovered a striking diminution in the usually notable numbers of the waterlily (*N. alba*) in a lake near Friedrichshagen, Prussia. The cause of this was a slime-producing coccus, almost always preceded by a fungus, *Leptothrix* sp. The disease, on account of its localization, was called phyllosepsis, and the organism was named *Coccus phyllosepticus*.

**Phytophthora blight of peony,** D. C. Cooper and C. L. Porter (*Phytopathology, 18 (1928), No. 11, pp. 881–899, pl. 1, figs. 5*).—Attempts with nine species of Phytophthora to inoculate the peony produced disease only in the case of one, which, following study, has been described as the new species *P. paeoniae*. This fungus, which rather closely resembles *P. cactorum* and *P. fagi*, but differs somewhat in morphology, cultural characteristics, and parasitic capabilities, produces primarily a tip and stem blight but often causes a leaf spot, the infected portions blackening and withering. Stalks are readily blighted by this fungus, the hyphae of which are intercellular in the cortex, pericycle, medullary rays, and pith. The spherical haustoria extend into the cells. No spores appear in the host tissue. Growth was not inhibited by the staling products. The optimum growth temperature lies between 20° and 26° C., the minimum about 14°, and the maximum about 34°.

**A discussion of the reported infectious chlorosis of the rose,** D. G. Milbrath (*Calif. Dept. Agr. Mo. Bul., 19 (1930), No. 8, pp. 535–544, figs. 5*).—In the condition of rose plants which has been called infectious chlorosis, as examined by the author, no proof of the presence of an infective material was found.

The declaration that the source of the infective material is in western rootstocks is claimed to have been merely an assumption, as the reactions from buds and scions do not necessarily implicate the root. Each variety must be tested separately. Also evidence is presented that this condition may occur in American Beauty rose plants on their own roots.

If this condition is due to a virus, the agent differs from all other viruses. Analogy of symptoms is unreliable as a basis for a plant disease diagnosis.

Injury or loss from this cause has not fulfilled expectation, as it has been exceeded by that due separately to black spot, powdery mildew, canker, thrips, spiders, or aphids.

**A new disease of Douglas fir** [trans. title], [C.] von Tubeuf (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 3–4, pp. 70–78, figs. 4*).—The appearance in Germany is noted of *Rhabdocline pseudotsugae* as a parasite of Douglas fir, with brief accounts of its earlier appearances, forms, and relations elsewhere. It is recommended that the admission of living Douglas firs or sections thereof be forbidden.

**A new elm disease,** C. May (*Science, 74 (1931), No. 1922, p. 437*).—As a result of a study of material received from Iowa, Missouri, New York, Washington, D. C., and various localities in Ohio, a new elm disease was recognized. The material had been sent to the Dutch elm disease laboratory, Wooster, Ohio, for identification as to possible infection by *Graphium ulmi*, which was reported in Ohio in 1930 (E. S. R., 64, p. 643).

A fungus was isolated from about 10 per cent of some 300 specimens examined, and inoculations were made from cultures of the organism. About a month after inoculation, symptoms of the disease appeared on 7 of 14 inoculated trees. The fungus was reisolated, and it has been tentatively referred to the genus Cephalosporium.

The organism and disease characteristics, which are said to be readily distinguished from *G. ulmi*, are briefly described.

**Oak mildew and its control in forest nurseries,** R. C. Woodward, J. S. L. Waldie, and H. M. Steven (*Forestry, 3 (1929), No. 1, pp. 38–56, pls. 2*).—Oak mildew, now a serious disease hindering reforestation by young oaks, was recorded for Great Britain in Devon in 1908, but it is now generally distributed over that area. It appeared as an epidemic in France in 1907, and spread rapidly eastward through Europe. Until 1911 only the conidial stage was seen, and no perithecia have yet been reported in Great Britain.

The fungus (variously considered as *Microsphaera alni*, *M. alni extensa*, or *M. alphitoides*) attacks oaks of all ages, most severely seedlings and coppice. Most commonly found in Great Britain on *Quercus pedunculata* and *Q. sessiliflora*, it occurs also on beech, and on the Continent it has been recorded as on sweet chestnut. Where the oaks have been defoliated by caterpillars or injured by frost, the new leaves are frequently attacked by mildew. Biological details are given, and successful control experimentation is outlined.

Sprays using 1 per cent sodium chloride and lime-sulfur burned the young foliage, dusted flowers of sulfur was unsuccessful, and ammonimum polysulfide was only partially efficient. Sheltering young plants was ineffective. Sprays using colloidal sulfur and flowers of sulfur made up as a paste at from 2 to 4 lbs. per 100 gal. of water controlled the mildew. Calcium caseinate was a more efficient spreader than was soft soap. One application on appearance of the mildew may suffice, but usually from three to five are necessary. Such treatments keep back infection, increase height growth, and increase the dry weight of the plants, besides decreasing bud infection and increasing the proportion of plants having good leaders.

**Lophodermium injury in western Norway** [trans. title], O. Hagem (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 7–8, pp. 193–208*).—The needle cast of pines, which has been considerable in the west coastal parts of Norway during several recent years, may be, it is claimed, partly due to excessive cold, heat, or transpiration; but supposedly it has in these instances been due mainly to attack by *L. pinastri*.

**The fate of Pinus strobus in Europe** [trans. title], [C.] von Tubeuf (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 1–2, pp. 1–32, figs. 19*).—Listing 36 of his own related publications extending over the period 1886–1927, and considering the question whether *P. strobus* is desirable as a factor in forest economy in Europe, the author reviews the available history of various fungi in connection with this and other hosts.

**Recent studies in life conditions for wood-destroying fungi, I** [trans. title], W. Bavendamm (*Centbl. Bakt.* [*etc.*], *2. Abt., 75 (1928), Nos. 15–24, pp. 426–452, figs. 8; 25–26, pp. 503–533*).—The present study made use of 32 of the more important wood-destroying fungi, including parasitic and saprophytic forms specialized on both coniferous and deciduous plants and on lignin, cellulose, and other components.

It is denied that, as is sometimes asserted, oxygen content is the only factor decisive as to attack or freedom therefrom, several factors seeming of significance.

**Tylenchus dipsaci Kühn or T. devastatrix Kühn?** [trans. title], M. Hollrung (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 7–8, pp. 221, 222*).—The author states briefly what he considers good reasons for retaining the name *T. devastatrix* Kühn instead of substituting for it *T. dipsaci* Kühn.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Common pests: How to control some of the pests that affect man's health, happiness, and welfare**, R. W. Doane (*Springfield, Ill.: Charles C. Thomas, 1931, pp. VIII+[397], figs. 215*).—The first section of this practical account deals with the pests of man and domestic animals (pp. 1–91), and the second section with insect control and some important pests of the orchard, garden, field, and household (pp. 93–384).

**The Pennsylvania deer problem** (*Penn. Bd. Game Commrs. Bul. 12* [*1930*], *pp. 66, figs. 13*).—The introductory account in the first part of this bulletin deals with the white-tailed deer situation in the State. This is followed by a report on Deer Investigations during the 1928 Special Doe Season, by B. S. Fritz (pp. 15–23), and Deer Investigation in Union and Snyder Counties, Pennsylvania, during 1928 Special Season on Antlerless Deer, by G. M. Sutton (pp. 23–28). Part 2 contains a brief introduction (pp. 29, 30) and reports as follows: Investigation of Deer Losses, by B. S. Fritz (pp. 31–35); Deer Investigations in Pennsylvania, March 13–15, 1929 (pp. 35–39), and Deer in Pennsylvania, November 6–9, 1929 (pp. 39–42), both by V. Bailey; Report of Deer Investigation during Deer Season of 1929, by B. S. Fritz (pp. 42–44); Examination of Starved Deer in Pike County, Pennsylvania, by V. Bailey (pp. 44–50); The Status of Mountain Laurel and Rhododendron as Foods for the White-Tailed Deer, by E. B. Forbes and S. I. Bechdel (pp. 50–60), an account of which has been noted (E. S. R., 64, p. 174); and a Preliminary Report on the Occurrence of the Nose Fly (Cephenomyia) in the Deer of Pennsylvania, by N. H. Stewart (pp. 61–66).

**Fur-bearing animals,** P. Schoebsch (*Pelztierkunde. Leipzig: Alexander Duncker, 1930, pp. 164, pls. 40*).—A handbook giving the name, geographical distribution, habitat, general characteristics, and uses of the pelts of fur-bearing animals.

**Bibliography on fur breeding** (*Edinburgh: Imp. Bur. Anim. Genet., 1931, pp. 37*).—An outline of the zoological classification of animals used for fur purposes (pp. 4–7) is followed by a general bibliography on fur-bearing animals up to the close of 1930 (pp. 8–15) and lists of the important literature on the more important fur bearers (pp. 16–36). Thirty-one journals relating to fur-bearing animals are listed (p. 37).

**The mink in captivity** (*Ontario Dept. Game and Fisheries Bul. 3 (1930), pp. 24, figs. 3*).—This practical account, while dealing mainly with the feeding and breeding of mink, includes a discussion of their diseases and parasites and means of treatment, together with plans for housing.

**The riddle of migration,** W. Rowan (*Baltimore: Williams & Wilkins Co., 1931, pp. XIV+151, figs. 11*).—This discussion deals particularly with the mechanism of bird migration.

**Check-list of birds of the world, Vol. I,** J. L. Peters (*Cambridge: Harvard Univ. Press, 1931, vol. 1, pp. XVIII+345*).—This first volume lists the recent birds of the world belonging to the subclasses Archaeornithes and Neornithes described prior to January 1, 1931, giving the normal range of each form. An index to the species and higher groups is included.

**Check-list of North American birds** (*Lancaster, Pa.: Amer. Ornithol. Union. 1931, 4. ed., pp. XIX+526*).—This is a fourth revised edition of the work, of which the third edition (E. S. R., 24, p. 555) appeared in 1910.

**Handbook of birds of eastern North America,** F. M. Chapman (*New York and London: D. Appleton & Co., 1932, 2. ed., rev., pp. XXXVI+581, pls. [31], figs. 166*).—In this second revised and enlarged edition of the work previously noted (E. S. R., 27, p. 549), the nomenclature has been changed to conform with the revised classification as it appears in the fourth edition of the Check-List of North American Birds, noted above. An effort is said to have been made to bring the work up to date both by the inclusion of new material and the deletion of old.

**Florida birds: Biographies of selected species of birds and compiled list of all species occurring in Florida,** R. J. Longstreet, R. W. Williams, H. L. Stoddard, F. M. Weston, et al. (*Fla. Dept. Agr. Quart. Bul., 41 (1931), No. 3, pp. 189+A9, pls. 32, figs. 11*).—Following introductory accounts by J. T. Brooks and C. C. Woodward, respectively, the classification and description of birds are dealt with by Longstreet (pp. 15–19). Then follow accounts of the birds, arranged by orders, by Longstreet, Williams, S. W. Partridge, Stoddard, Weston, and L. R. Lovelace (pp. 20–176), and suggestions to teachers (pp. 177–189), including a bibliography, by Longstreet. A list of the birds of Florida, compiled by A. H. Howell, is appended (pp. A1–9).

**Bird memories of the Rockies,** E. A. Mills (*Boston: Houghton Mifflin Co., 1931, pp. XVIII+263, pls. 23*).—This practical account includes descriptions of observations of the habits of birds in the Rocky Mountain region.

**Australian birds** (*[Melbourne]: Shell Co. Ltd., [1930], pp. 64, figs. 93*).—A well-illustrated descriptive guide with several colored plates, which latter include illustrations of the eggs of 30 forms. The illustrations consist largely of reproductions of photographs of wild birds taken in their natural surroundings.

**Game farming: A text-book for the more efficient and economical propagation of pheasants, quail, wild ducks, and ornamental birds, H. Mitchell** (*Portsmouth, N. H.: Haley Pub. Co., 1930, pp. [7]+162, figs. 57*).—This is a practical account presented in the form of 10 lessons.

**Some effects of temperature upon development of the oocysts of coccidia, E. R. Becker and H. B. Crouch** (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 5, pp. 529, 530*).—The experimental work here reported shows that the optimum temperature for the development of *Eimeria magna* and *E. perforans* in a 2 per cent potassium dichromate solution is 33° C. (91.4° F.), and that the thermal death point of the nonsporulated oocysts is surprisingly low, namely 51°.

**Animal ecology, with especial reference to insects, R. N. Chapman** (*New York and London: McGraw-Hill Book Co., 1931, pp. X+464, figs. 153*).—This work, having its origin in a course in insect ecology given at the University of Minnesota commencing in 1917, lecture notes on which appeared in 1925 in mimeographed form (E. S. R., 56, p. 250), is the result of a continued revision. All but the fourth of the 21 chapters are accompanied by a copious bibliography. The work includes the reprint of a paper presented by V. Volterra in 1928, entitled Variations and Fluctuations of the Number of Individuals in Animal Species Living Together (pp. 409–448).

**The determination of the blood volume of insect larvae, C. H. Richardson, R. C. Burdette, and C. W. Eagleson** (*Ann. Ent. Soc. Amer., 24 (1931), No. 3, pp. 503–507*).—Two methods to be employed in the determination of the blood volume based upon examinations of the larvae of the silkworm and the wax moth, namely, the absorption method and the dry weight method, are here described. It is said that with slight modification they may be applied to many other insect larvae and possibly to some adult insects.

**Flowers and insects, C. Robertson** (*Carlinville, Ill.: Author, 1928, pp. 221*).—A list is first given of all the insects taken on flowers, arranged alphabetically by families under the headings of long-tongued bees, short-tongued bees, other Hymenoptera, Diptera, Lepidoptera, Coleoptera, Hemiptera, and Neuroptera (pp. 8–20). This is followed by lists of the visitors arranged in systematic order by host plants, these being arranged alphabetically by orders and genera. It is pointed out that while earlier contributions by the author, beginning September, 1887. and ending July, 1899, given in the bibliography, recorded 7,817 visits to 278 flowers, the present work records 15,172 visits to 441 flowers.

**[Report of work in entomology]** (*Alabama Sta. Rpt. 1931, pp. 47–49*).—Of 13 dust materials used by J. M. Robinson for control of the turnip webworm, barium fluosilicate, sodium fluosilicate, lead arsenate, calcium arsenate, and cryolite, killed 100 per cent of the larvae. The mortality obtained from the use of the other materials was too low to warrant further tests. Of 11 materials that were applied as sprays for control of the webworm larvae, sodium arsenite killed the plants and the others proved to be of little value.

A method developed by L. L. English which may give accurate data as to the proper timing of oil sprays for the control of scale insects consists in the placing of removable tanglefoot bands on the infested limbs to catch the emerging crawlers, a fresh band being placed each week and the number of captured crawlers recorded. Fumigation with calcium cyanide dust was found by English to be more effective against the camphor scale than one application of a 2 per cent oil emulsion. A combination treatment of oil followed by fumigation was slightly more effective than fumigation alone.

In studies of the life history and control of the cowpea curculio, commenced by F. S. Arant in 1930, the duration of the life cycle from egg to adult was found to vary from 23 to 53 days, with an average of 30.8. Approximately 13 days of the average period were spent within the pea and the remaining 18 days within the soil. In a study aimed at the determination of the susceptibility of various varieties of cowpea to adult attack, 13 planted at 4 different times during the season were tested. The White Crowder variety, with 65.1 per cent of the peas punctured, was injured most severely, and the Black Crowder, with 20.1 per cent of the peas punctured, least severely of all the varieties tested. Of 9 different insecticides tested to determine their effectiveness against adults, sodium fluosilicate, barium fluosilicate, and lead arsenate produced a high mortality when dusted upon cowpea foliage.

Life history studies of the pecan weevil were continued by H. S. Swingle (E. S. R., 65, p. 449). The adults emerged during August and September; oviposition began August 22 and reached the peak during the second week of September, the average number of eggs per female being 11.3. The larvae began to hatch out September 26 and continued to emerge until the following spring. The infestation of the year was approximately twice as great as that of 1930, about 45 per cent of the Schley, Stuart, and Success varieties at Camp Hill remaining on the trees at harvest time having been punctured by the weevils. Similar damage is said to have been experienced at Lanett and in other parts of the State. Three dipterous parasites, namely, *Myiophasia nigrifrons* Towns., *Sarcophaga sima* Ald., and *Winthemia rufopicta* Bigot, were reared from the larvae, although the parasitism reached less than 2 per cent. Two fungus parasites (*Metarrhizium anisopliae* and *Sporotrichum bassiana*) and two undetermined bacterial forms were found attacking the larvae.

**[Contributions on economic entomology]** (*Ill. State Acad. Sci. Trans., 21 (1928), pp. 46–58, 74–76, 84–93, fig. 1, pp. 109–135, figs. 15*).—The contributions here presented are as follows: Our Friends the Insects, by W. V. Balduf; Some Phases of the European Corn Borer Control Program, by W. P. Flint; The Life History of the German Cockroach, by H. H. Ross; and The Mouthparts of Insects, by C. L. Metcalf.

**[Contributions on economic insects]** (*Min. Agr. [France], Ann. Épiphyties, 16 (1930), No. 3–4, pp. 103–189, pls. 2, figs. 27; 190–208, pls. 5, figs. 7; 232–234*).—The contributions here presented (E. S. R., 64, p. 358) include Studies of the Biology and Cytology of Some Thysanoptera [trans. title], by E. Pussard-Radulesco (pp. 103–189), with a bibliography of eight pages; A Contribution to the Study of Three Coleoptera Injurious to Cereals [*Lema cyanella* L., *L. melanopus* L., and *Chaetocnema aridula* Gyll.] [trans. title], by L. Mesnil (pp. 190–208); and The Question of Races of the Grape Phylloxera [trans. title], by A. Vandel (pp. 232–234).

**[Contributions on economic entomology in Russia]** (*Vsesoi͡uzn. Akad. Selsk. Khoz. Nauk V. I. Lenina, Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect., Bul. Plant Protect.), Ent., 1 (1930), No. 1, pp. 274, pl. 1, figs. 44*).—The contributions here presented are as follows: The Migratory Locust (*Locusta migratoria* L.) in the Ryazan-Tambov Lowland, by S. A. Predtechenskiĭ (Predtetshensky) (pp. 3–49, Ger. abs. pp. 47–49); The Zonal and Ecological Distribution of Acrididae in West Siberian and Zaisan Plains, by G. I͡A. Bei-Bienko (G. J. Bey-Bienko) (pp. 51–90, Eng. abs. pp. 87–89); The Periodicity of the Asiatic Migratory Locust [*Locusta migratoria*], by N. G. Olsuf'ev (Olsoufiev) (pp. 91–147, Ger. abs. pp. 140–145);

Practical Results of the Ecological Studies of the Migratory Locust [*Locusta migratoria*] in Central Russia, by S. A. Predtechenskiĭ (Predtetshensky) (pp. 149–159, Ger. abs. pp. 158, 159); Studies on the Dermaptera and Orthoptera of the District Omsk, West Siberia, by G. I͡A. Beĭ-Bienko (G. J. Bey-Bienko) (pp. 161–177, Eng. abs. pp. 175, 176); The Fall Generation of *Locusta migratoria* L. in Daghestan in 1927, by A. M. Frantsi (Franzi) and N. N. D͡iukov (Djukov) (pp. 179–189, Eng. abs. pp. 188, 189); Contributions to the Study of the Flies Parasitic on the Larval and Adult Instars of the Migratory Locust (*Locusta migratoria*), by B. I. Rukavishnikov (pp. 191–261, Eng. abs. pp. 252–259); and On the Biometrical Characteristic of the Races of the Asiatic Locust (*Locusta migratoria*), by V. N. Makalovskai͡a (Makalovskaja) (pp. 263–274, Eng. abs. p. 273).

**A list of the sugar cane insects of Negros Occidental, W. D. Pierce** (*Jour. N. Y. Ent. Soc., 39 (1931), No. 4, pp. 577–586*).—This list is given in the account previously noted (E. S. R., 64, p. 242).

**Heat treatment for controlling the insect pests of stored corn, E. F. Grossman** (*Florida Sta. Bul. 239 (1931), pp. 24, figs. 11*).—Data on the heat resistance of insects (pp. 4–13) are reported, the lethal temperatures and their variations being noted, and many of the details being presented in chart and tabular form. Exposure for 1 hour at a temperature of 50° C. (122° F.) was found to kill the rust-red flour beetle, rice weevil, square-necked grain beetle (*Silvanus gemellatus* Duv.), Angoumois grain moth, and the slender-horned flour beetle (*Gnathocerus maxillosus* Fab.). An exposure to a temperature of 42° for 200 hours was also lethal. The pupae resist a given temperature for a longer period of time than the larvae, which, in turn, are able to resist longer exposures than the egg and adult stages. The young adults were found to resist more heat than older ones.

In a study of the heat resistance of corn (p. 14), the effects of heat on the germination of the seed and the vigor of the plants growing from heat-treated seed are recorded. In this work three varieties of corn well known in Florida, namely, Cuban Yellow Flint, Whatley, and Tisdale, were heat treated to determine the limits of heat exposures which did not affect germination or subsequent plant vigor. An exposure to a temperature of 47° for 144 hours did not reduce the germination percentage or the vigor of the growing plants. Five hours at 56, 57, 58, and 59° appeared to affect the seed very little, if at all, as vigorous plants grew from the treated seed which were planted in the field. An exposure to a temperature of 70° for one-half hour showed but slight injury, while one hour's exposure killed the seed. Ten minutes at 80° killed the seed.

The temperatures attained in various positions in a mass of 300 bu. of slip-shucked and shucked corn placed in a tobacco barn (pp. 14–23) were accurately measured. Slip-shucked corn piled in a pyramidal heap on flooring built on the lowest tier poles of a tobacco barn can not be effectively heated for the control of insect pests of stored corn. Shucked corn, however, when spread to a depth of 3 ft. on the flooring can be effectively heat treated with an 18-hour exposure and with a 13-hour exposure when spread to a depth of 2.5 ft., if the air in the tobacco barn is maintained at a minimum temperature of 83°. When the outside air temperature falls below 10°, longer exposures are necessary. Seed corn should not be heated together with the corn to be used for feeding purposes, since the higher temperatures which are reached in the barn will injure germination and plant vigor.

**New fumigants for destroying insect pests in foodstuffs, R. C. Roark** (*Food Indus., 3 (1931), No. 9, pp. 398, 399*).—This brief account of new fumigants includes a list of 26 references to the literature.

**A simple and inexpensive portable screener for use with Paris green diluents,** N. M. BUTT (*Rec. Malaria Survey India, 2 (1931), No. 2, pp. 333-335, fig. 1*).—A description and illustrations are given of a new portable screener for use with Paris green diluents.

**Volck Special Emulsion Number 2 as a control for external parasites of animals,** H. L. CALER (*Jour. Kans. Ent. Soc., 4 (1931), No. 4, pp. 77-98*).—The author reports upon the results of 4 years' experimental work at the Kansas Experiment Station with Volck Special Emulsion No. 2 as a control for ectoparasites, many of the details of which are given in tabular form.

It was found that a 7 per cent solution applied as a dip and thoroughly worked into the feathers was an effective control for the common lice on poultry. A 50 per cent solution applied as a spray controlled the common poultry mite in an old poultry house. A 10 per cent solution applied as a spray and thoroughly worked into the hair controlled both the biting and sucking lice on cattle. A 10 per cent solution thoroughly applied as a spray, dip, or wash to dogs and cats eliminated all fleas from the animals, but did not prevent reinfestation in a few days. It was found that the animal should be bathed in soap and water one day after treatment to remove the excess oil. A 10 per cent solution killed all the lice on three donkeys when applied as a spray and worked in. Volck applied alone did not control mange mites. A 50 per cent solution did not control ox-warbles when injected into the cysts. A 10 per cent solution when applied as a spray controlled the sucking lice on hogs.

A mixture of 1 part of Emulsion No. 2, 2 parts pine tar oil, 1 part concentrated soap solution in water, and 1 part of water was an effective repellent spray for flies on cattle (the house fly, stable fly, and horn fly). Undiluted Emulsion No. 2 was an efficient ovicide when applied to eggs of the horse botfly. A 10 per cent solution was an effective control for biting and sucking lice on horses, and applied as a dip controlled the mites on snakes in the museum. Solutions as high as 50 per cent were apparently not toxic to dipterous larvae. Emulsion No. 2 when taken internally by animals in such concentrations and amounts as might be expected when being treated with Volck was not harmful to them.

An 8 per cent solution eliminated all the mites (Liponyssus) from two birds. Emulsion No. 2 apparently had some value as a treatment for chiggers on man. It acted as a palliative but did not wholly stop the itching. It was nonirritating to the skin of animals or delicate tissues such as the eyes.

**A preliminary report on an investigation into the biological control of West Indian insect pests,** J. G. MYERS (*[Gt. Brit.] Empire Marketing Bd. [Pub.] 42 (1931), pp. 173, pl. 1, fig. 1*).—The main part of this report deals with the practical work under the headings of ecological conditions in the countries visited (pp. 20–66) and observations on particular insect pests (pp. 66–151). A 17-page list of references is included.

**A new Haplothrips from Panama,** J. R. WATSON (*Fla. Ent., 15 (1931), No. 1, pp. 11, 12*).—Under the name *H. panamaensis* the author describes a new thrips taken in an inspection house at Washington, D. C., on pineapple cuttings from the Canal Zone.

**A pentatomid predator of the spiny caterpillar of cotton (Earias huegeli)** [trans. title], J. RISBEC (*Compt. Rend. Acad. Sci [Paris], 193 (1931), No. 4, pp. 247–250*).—An undetermined pentatomid predator has been found by the author to be an important enemy of the most important pest of cotton, *E. huegeli*, in the island of New Caledonia. Observations of its biology are noted and descriptions given of its life stages. It was observed that in the course of its life a single bug destroys at least 50 caterpillars.

**Endemic typhus fever: Rat flea as a possible vector,** H. A. Kemp (*Jour. Amer. Med. Assoc., 97 (1931), No. 11, pp. 775–777*).—Studies conducted at Dallas, Tex., are here reported, the details being given in tabular form. Guinea pigs inoculated with fleas removed from rats that had been trapped at a typhus focus developed lesions characteristic for endemic typhus fever. Animals recovered from an attack produced by this virus were found to be immune to a strain of typhus virus established from the blood of a human patient with endemic typhus. Animals that were immune to blood virus were immune to the strain of rat flea virus established by guinea pig inoculation.

**The multiplication of the virus of Mexican typhus fever in fleas,** H. Mooser and M. R. Castaneda (*Jour. Expt. Med., 55 (1932), No. 2, pp. 307–323, pl. 1*).—The authors have found the virus of Mexican typhus to multiply abundantly in five species of fleas, namely, the oriental rat flea, *Ceratophyllus fasciatus*, *Leptopsylla musculi*, the dog flea, and the cat flea. In all fleas, *Rickettsia prowazeki* was demonstrated within the epithelial cells of the stomach and within the cells of the Malpighian tubules.

**The transmission of the virus of Mexican typhus from rat to rat by Polyplax spinulosus,** H. Mooser, M. R. Castaneda, and H. Zinsser (*Jour. Expt. Med., 54 (1931), No. 4, pp. 567–575*).—The authors find that the common rat louse *P. spinulosus* is easily infected with the virus of typhus by feeding on infected rats. Such feedings are followed by the appearance of large numbers of *Rickettsia prowazeki* within the gut of the insect. The virus of Mexican typhus can be transmitted from rat to rat by this louse by means of feeding simulating natural conditions, indicating that it is an important factor in maintaining an endozoic of Mexican typhus among wild rats.

**Classification of the Old World Membracidae,** F. W. Goding (*Jour. N. Y. Ent. Soc., 39 (1931), No. 3, pp. 299–313*).—Keys are given to the subfamilies and to the tribes and genera of Membracidae.

**On a nematode parasite of psyllids** [trans. title], R. Pussard (*Compt. Rend. Acad. Sci. [Paris], 194 (1932), No. 5, pp. 493, 494*).—The author reports upon observations in the Lyon region of a nematode of the genus Mermis as a parasite of *Psyllia* spp.

**The plant lice, or Aphiidae, of Illinois,** F. C. Hottes and T. H. Frison (*Ill. Nat. Hist. Survey Bul., 19 (1931), Art. 3, pp. 121–447, pls. 10, figs. 50*).—The first or introductory part of this work (pp. 123–147) includes a discussion of structure, life histories, distribution, the Cyrus Thomas collection, designation of types, collection and preservation of material, applied control, and natural control and interrelations. Part 2 (pp. 148–447) takes up the classification of the family Aphididae and includes a key to subfamilies and keys to and descriptions of new species and two new genera (Paducia, Shenahweum) (pp. 148–377). Part 3 (pp. 378–447) includes keys to the species of plant lice occurring in Illinois, grouped with reference to host plants, a host index, bibliography, plates, addenda, and a general index.

**Biological control of citrus mealy bug,** [I], II, H. J. Bishop (*Farming in So. Africa, 6 (1931), Nos. 65, pp. 177, 178, figs. 3; 66, pp. 217, 218*).—The first part of this contribution discusses the necessary requirements for the biological control of the citrus mealybug by the Cryptolaemus beetle and the second part the breeding of this beetle.

**Additional report on experiments with oil spray for red scale,** R. H. Smith and W. Ebeling (*Calif. Citrogr., 16 (1931), No. 10, pp. 451, 496, figs. 2*).—This contribution supplements that previously noted (E. S. R., 66, p. 156).

**Factors of importance in the application of spray,** R. H. Smith (*Calif. Citrogr., 16 (1931), No. 11, pp. 501, 515*).—In this contribution from the California Citrus Experiment Station it is pointed out that without doubt the poor control of the black and citricola scales and other insects obtained through the use of oil spray has been due in many cases to its being too low in insecticidal efficiency, one or more of three factors being involved. The importance of the manner of application of the spray to the orange, particularly of increasing the thoroughness as the percentage of infestation rises, is emphasized.

**The butterfly book,** W. J. HOLLAND (*Garden City, N. Y.: Doubleday, Doran & Co., 1931, rev. ed., pp. XII+424, pls. 77, figs. 198; rev. in Canad. Ent., 63 (1931), No. 10, pp. 244–246*).—In this new and thoroughly revised edition of the work, which first appeared in 1898 and which contained figures of 513 species and varieties, the author has added the necessary plates and text to include those originally omitted because found in remote parts of the continent and also a number described in recent years. In a very few cases, where figures are not given, information is given as to where such illustrations, if they exist, may be found. The work thus becomes a complete illustrated manual, popular in form though strictly scientific in content, of the butterflies of North America from the polar regions to the Gulf of Mexico.

The review is by J. McDunnough.

**A contribution to the life history and habits of the celery leaf tyer Phlyctaenia rubigalis Guenee in Florida,** R. L. MILLER (*Fla. Ent., 15 (1931), No. 2, pp. 28–34*).—This contribution deals with the distribution and host plants and the life history of the greenhouse leaf tyer. The abundance and increase of the adults during the celery growing season at Sanford, Fla.; seasonal host plants at Sanford during the year 1929; a summary of the life history and rearing of the greenhouse leaf tyer; and the relation between humidity and development are reported upon in tabular form At Sanford, where it feeds on some 70 host plants, there were nine first-born generations and seven last-born generations during the year December, 1928, to December, 1929, these having been fed entirely on celery and *Bidens leucantha.*

**A comparison of the resistance of South African corn and American corn to infestation by the European corn borer** [trans. title], T. ELLINGER and V. CHORINE (*Ann. Inst. Pasteur, 46 (1931), No. 4, pp. 480, 481*).—The authors have found Natal, a South African variety of corn, to be more resistant to infestation by the European corn borer than is the North American variety Wallace, the difference in infestation being a little less than 50 per cent. See also a previous note (E. S. R., 64, 751.)

**[Work with bacterial diseases of the European corn borer]** (*Ann. Inst. Pasteur, 46 (1931), Nos. 3, pp. 320–336; 4, pp. 467–479*).—Contributions relating to diseases of the European corn borer are as follows: The Utilization of Microbes in Combating the European Corn Borer, II. by S. Metalnikov, B. Hergula, and Strail (pp. 320–325) (E. S. R., 64, pp. 364, 751); The Utilization of Microbes in Combating the European Corn Borer, by V. Chorine (pp. 326–336) (E. S. R., 64, p. 751); and A Study of New Microbes Pathogenic for the European Corn Borer, IV, by S. Metalnikov, J. Ermolaeva, and Skobelzyne (pp. 467–479) (E. S. R., 64, p. 751).

**Codling moth control,** C. J. JOUBERT (*Farming in So. Africa, 6 (1931), No 66, pp. 229, 231, 232*).—Reporting upon cooperative methods for controlling the codling moth, it is pointed out that a medium summer oil plus nicotine sulfate added to some of the lead arsenate sprays gives more effective control than lead arsenate alone. In six of seven tests of cryolite the results obtained were better than those obtained with arsenate of lead.

**An important breeding place of clothes moths in homes,** G. J. SPENCER (*Canad. Ent., 63 (1931), No. 9, pp. 199, 200*).—Attention is called to the importance as a breeding place for clothes moths of the felt pad composed of woolen fluff that gathers in the cold-air shafts of hot-air furnaces.

**The British species of Nonagria,** H. M. Edelsten (*So. London Ent. and Nat. Hist. Soc. Proc., 1931-32, pp. 1-5*).—Notes are presented on the species of noctuids of this genus occurring in Great Britain. The larvae of all these species feed and pupate within the stems of marsh plants.

**Further work on Chara spp. and other biological notes on Culicidae (mosquitoes),** R. Matheson and E. H. Hinman (*Amer. Jour. Hyg., 14 (1931), No. 1, pp. 99-108*).—Reporting upon further studies of this subject (E. S. R., 62, p. 857; 64, p. 461), the authors' experiments are said to indicate clearly that the species of Chara (*C. vulgaris* L., *C. delicatula* Ag., *C. contraria* Kutz., *Chara* sp. from Junius Bogs, and *Chara* sp. from Tully Lake) have a marked effect on the development of mosquito larvae.

"It has been shown that this effect is not a toxic one, but rather due, in all probability, to the excessive amount of oxygen given off in tiny bubbles during photosynthetic activity. These tiny bubbles of oxygen either are swallowed by the larvae, causing death, or they become entangled in their mouth brushes, body hairs, etc., and so interfere with their normal activities as to bring about death. Experiments have been devised which demonstrate that the continual passage of minute bubbles of oxygen through water cause the death of mosquito larvae. We have shown (in one experiment) that mosquito larvae can develop and reach maturity in Chara cultures grown in the dark, whereas the same species of Chara grown in sunlight caused the death of all larvae experimented with.

"It would seem safe to conclude that bacteria per se are not essential as a larval food. A species of brown Hydra has been observed to be an efficient destroyer of mosquito larvae. In our aquaria it was able to ingest practically mature larvae."

**Experimental transmission of endemic typhus fever of the United States by the rat flea (Xenopsylla cheopis),** R. E. Dyer, E. T. Ceder, A. Rumreich, and L. F. Badger (*Pub. Health Rpts. [U. S.], 46 (1931), No. 41, pp. 2415, 2416*).—The authors report that the virus of endemic typhus has been experimentally transmitted from rat to rat by the oriental rat flea.

**Studies on the metamorphosis of the Japanese beetle (Popillia japonica Newman).—I, Weight and metabolism changes,** D. Ludwig (*Jour. Expt. Zool., 60 (1931), No. 3, pp. 309-323, figs. 2*).—It was found that during the metamorphosis of the Japanese beetle from larva to adult, a loss of weight amounting to one-half of the maximum larval weight occurs. During the emergence of the adult the loss of weight amounts to one-third of the pupal weight. A study of the water content of different stages has shown that this loss of weight is due principally to loss of water. During metamorphosis the water content decreases from 78 per cent in the larval stage to 74 per cent in the prepupal and pupal stages, and to 66.6 per cent in the adult. The metabolism curves show a decrease in rate of oxygen consumption during the last four or five days of the prepupal stage which continues for several days of the pupal stage. This is followed by an increase in rate until the time of emergence. The respiratory quotient of the larva varies from 0.7 to 0.97. During metamorphosis it gradually decreases, and in the pupa varies from 0.4 to 0.7. The emergence of the adult is followed by an increase to 0.7 and 0.8.

**The influence of soil acidity on the pH value of the contents of the digestive tract of Japanese beetle larvae,** M. C. Swingle (*Ann. Ent. Soc. Amer., 24 (1931), No. 3, pp. 496-502, fig. 1*).—In studies in which Japanese beetle larvae from soil samples varying in pH from 6.9 to 3 were dissected and the pH of the various regions of their digestive tract determined, it was found that the pH of the digestive tract of the larvae was not greatly influenced by the pH of the soil in which they fed. The buffer strength of the fore, mid, and hind guts of the larvae was practically the same toward acid solutions. The soil was found to be only slightly buffered against alkaline solutions, thus accounting for the fact that the mixture within the digestive tract has a fairly constant pH regardless of the pH of the soil in which the larvae were feeding.

**Effect on certain fresh fruits of fumigation with ethylene oxide to destroy the Japanese beetle,** M. R Osburn (*Jour. N. Y. Ent. Soc., 39 (1931), No. 4, pp. 567–575, figs. 7*).—It was found that ethylene oxide, when used at the rate of 2 lbs. per 1,000 cu. ft. for 2 hours at 75° F., destroyed adults and larvae of the Japanese beetle, adult Colorado potato beetles, and adult Mexican bean beetles without any appreciable damage to raspberries and blackberries. It is, however, slightly injurious to blueberries, severely injures wet green bananas, and is injurious to the foliage of Azalea and Hydrangea.

**A wire beetle receptacle for Japanese beetle traps,** E. G. Rex (*Jour. N. Y. Ent. Soc., 39 (1931), No. 4, pp. 593–597, figs. 2*).—The wire beetle receptacle here described and illustrated, when given a thorough trial during the beetle season of 1931, was demonstrated to have the following advantages: (1) A capacity of 4 qt. may be attained without appreciable addition of weight, (2) there is no necessity for cleaning or washing it, and (3) aeration of the mass of captured beetles delays the appearance of decomposition odors several days after capture.

**Evaporation from the meal-worm (Tenebrio: Coleoptera) and atmospheric humidity,** P. A. Buxton (*Roy. Soc. [London], Proc., Ser. B, 106 (1930), No. B 747, pp. 560–577, figs. 8*).—The author here discusses the results obtained by keeping meal worms at 23 and 30° C. and in atmospheres of various humidities. Even in dry air and at 30°, fasting larvae generally live a month. It appears that metabolism must be low, as was shown to be the case by weighing the daily production of $CO_2$ from fasting larvae kept in dry air.

"The loss of water from a fasting meal worm is complex. For humidities below 90 per cent, the loss is nearly identical in larvae kept at 23 and 30° at the same saturation deficiency. But neither saturation deficiency nor any other measure of atmospheric humidity explains the loss at several humidities and any one temperature. It seems that there is a definite limit to the amount of water which a larva can lose in a day; also that in nearly saturated air the larva produces more water of metabolism than it can get rid of. It is shown that the larva can maintain the proportion of water in its body nearly constant, during a month's fast, at humidities from 0 to 60 per cent. It appears that it is able to do this by consuming some stored substance and holding the water produced in metabolism."

**Insect enemies of the cotton boll weevil,** E. F. Grossman (*Fla. Ent., 15 (1931), No. 1, pp. 8–10*).—This further contribution from the Florida Experiment Station (E. S. R., 61, p. 856) is based upon visits to cotton fields in Florida, Georgia, and Alabama during the summers of 1927 and 1930 for the express purpose of determining the abundance of insect enemies of the boll weevil. In 1927 infested cotton squares were collected from 16 representative fields and in 1930 from 24 fields and forwarded to the insectary at Gainesville, Fla., where the boll weevils and their parasites were hatched and recorded, the details being given in tabular form. The total number of parasites recovered in 1930 was 47 from 11,559 cotton squares, compared with 387 parasites from 8,451 squares in 1927. The percentage of boll weevils was also lower (13.9 per cent) in 1930, as compared with 29 per cent in 1927. It is pointed out that the cotton yields were practically the same for the two years, ranging from 0.25 to 0.75 bale per acre.

**Methods for making counts of boll weevil infestation, E. F. Grossman** (*Florida Sta. Bul. 241* (*1931*), *pp. 22*).—A comparison of a new method of making boll weevil infestation counts, said to have been devised at the station in 1925 by J. P. Camp and P. W. Calhoun, with the so-called point and survey methods previously quite generally employed is reported upon at length, the details being given in tabular form. It is explained that in the point method 100 cotton squares taken from adjacent plants in from 4 to 8 centrally located points in the field are examined, the number of groups examined depending upon the size of the field. There are, however, variations in the manner of conducting these counts. In the survey method counts are made at random either while walking in a circular path or in a diagonal line through the field, there being a variation with various investigators as to the number of squares (25 to 100) observed at each place of examination. In the new method studied by the author a diagonal path through the field is followed while taking random infestation counts. Instead of stripping a specified number of squares from the plants as in the survey method, plants (a definite number) are designated for the counts and all squares large enough to be attacked by the boll weevil, either for feeding or egg-laying purposes, are counted on each plant. Only one plant in any one locality was examined in small cotton fields. Where the fields were large, two or more series of 20 plants each were included in the infestation count, and the number of infested squares divided by the total number of squares counted on the 20 plants yielded the infestation percentage for the field.

An analysis of a half-acre cotton field, in which all squares on all plants were examined, indicated that the greater the number of squares examined the closer the estimated percentage of infestation approaches the actual percentage of infestation of a lightly infested field. Heavily infested fields, however, require the examination of relatively few squares. A comparison of the several methods of obtaining infestation counts indicated that one method was as satisfactory as any other and consequently the method involving the least labor is most suitable for general use. The 20-plant method, which involves comparatively little labor, has been found to be satisfactory. It is pointed out that the determination of the number of boll weevils in a sparsely populated field is attendant with great errors regardless of the method employed.

**Winter survival of immature stages of the boll weevil, E. F. Grossman** (*Fla. Ent., 15* (*1931*), *No. 1, pp. 13, 14*).—In this contribution from the Florida Experiment Station the author reports having found no living stages of immature boll weevil during a midwinter examination of a large number of bolls and squares attached to cotton plants which had been plowed up late in the fall of 1927 and subsequently piled together to serve as a windbreak. Numerous live adult weevils, however, were found among the large number of dead weevils, pupae, and larvae which were discovered in the cotton débris. In order to eliminate the factors which might greatly increase the boll weevil mortality rate during the summer months, a number of cotton squares and bolls were removed from an infested field on November 17, 1928, and placed in a low temperature incubator regulated to maintain a temperature of 55° F. and from 80 to 90 per cent relative humidity, previously determined to be near the optimum (E. S. R., 64, p. 549). After the cotton had been in the incubator 69, 92, 123, 131, and 139 days, respectively, individual squares and bolls were opened until a live weevil stage was found. Many dead larvae were found, but not a single live one. Several live pupae were found, two having lived as long as 92 days after having been placed in the incubator.

Live adults were found after periods of 92, 123, and 131 days, respectively, in the incubator, but no more live weevil stages were found after 138 days.

**Biology of the Mexican cotton boll weevil.—VII, The boll weevil in artificial hibernation quarters**, E. F. GROSSMAN (*Fla. Ent., 15 (1931), No. 2, pp. 21–27, fig. 1*).—This further contribution on the subject from the Florida Experiment Station (E. S. R., 64, p. 549) deals with the boll weevil in artificial hibernation quarters, the details being given in tabular form.

**Hibernation of the cotton boll weevil under controlled temperature and humidity**, E. F. GROSSMAN (*Florida Sta. Bul. 240 (1931), pp. 19, figs. 4*).—This is a summary of studies conducted, including experimental data obtained in 1927–28 and 1928–29, earlier accounts of which have been noted (E. S. R., 61, p. 856; 64, p. 549; 66, p. 252; also see above).

In the course of the work it was found that of approximately 125,000 weevils used in experiments conducted in controlled temperature incubators maintained at 47, 60, and 81° F. and between 79 and 85 per cent relative humidity, one individual lived for 359 days in artificial hibernation quarters maintained at 47°, while 20 per cent of 32,000 weevils were alive at the end of 170 days, 15 per cent at the end of 206 days, and 10 per cent at the end of 236 days. It is concluded from these data that in Florida if all other hazards than those affected by temperature and humidity are eliminated, 10 per cent of the weevils entering hibernation on November 1 could survive until June 24, and 15 per cent of those entering on December 1 and 20 per cent of those entering on January 1 could live until the same date. The results obtained with weevils placed in the incubators maintained at 47° indicated that there were two periods of increased mortality rates, the first occurring during the first month of dormancy and the second following a period of several months of low mortality rate. The extended period of low mortality rate is apparently dependent on the condition of the weevil at the time it enters hibernation, well fed weevils being long lived and poorly fed weevils short lived.

It is pointed out that the destruction of cotton stalks as soon as possible after the crop has been picked not only removes the breeding quarters of the boll weevils, thereby reducing the number of weevils which can prepare themselves for hibernation, but also prevents the weevils already in the field from feeding adequately for withstanding an extended period of hibernation.

**Acrotomopus atropunctellus Boh. in Argentina sugarcane**, H. A. JAYNES (*Ann. Ent. Soc. Amer., 24 (1931), No. 3, pp. 554–560, figs. 4*).—This is an account of observations of *A. atropunctellus*, a weevil which seems to be generally distributed throughout the sugarcane-growing region of Argentina, both larvae and adults having been obtained from several different points, although not found in any great numbers except at Ledesma, Jujuy, and at Rio Chico, Tucumán. By puncturing them for food, the adults kill a large number of the young cane shoots, which, together with those containing young weevil larvae, become brown and die. The outside leaves become dry as well as the center leaves, thus distinguishing this injury from the characteristic "dead heart" injury of the sugarcane borer, which at first turns yellow only in the center. The weevil larva makes a large sized tunnel through the cane, leaving the burrow full of frass, which makes it easily distinguishable from the tunnel made by the sugarcane borer.

It is suggested that since this weevil has thus far done damage only in small localities, it may be more or less controlled by its parasites, of which the dexiid fly *Paratheresia claripalpis* V. d. Wp. was reared by the author. It is pointed out that this same species parasitizes the sugarcane borer to a large extent in both Argentina and Peru.

**Is a bee attracted to clover blossoms by odor?** R. C. Malhotra (*Jour. N. Y. Ent. Soc., 39 (1931), No. 3, pp. 273–277*).—Data presented in tabular form seem to indicate that pollen to which odorous material almost similar to that found in natural clover flowers was added was most favorable for attracting bees, as indicated by the percentage loss of pollen under the conditions of this experiment.

**Temperature as a factor in the activity and development of the Chinese strain of Tiphia popilliavora (Rohw.) in New Jersey and Pennsylvania,** J. K. Holloway (*Jour. N. Y. Ent. Soc., 39 (1931), No. 4. pp. 555–565, figs. 4*).—In studies at Moorestown, N. J., the author found temperatures between 65 and 75° F. to be the optimum for mating of the Chinese strain of *T. popilliavora*, a parasite of the Japanese beetle. The average length of life for adults was 22.77 days when kept at a constant temperature of 68°. With the emergence occurring the second week in October, only 10 of the 22 days of life would be at all favorable for mating. Temperatures below 60° were found to be unfavorable for the development of the Tiphia larvae and for cocoon formation. The soil temperatures in October do not inhibit oviposition, but will hold this activity at a minimum. The mean soil temperatures during the developmental period are 59.8° at 6 in. and 59.7° at 9 in.

**Occurrence of a colony of the tick parasite Hunterellus hookeri Howard in West Africa,** C. B. Philip (*Pub. Health Rpts. [U. S.], 46 (1931), No. 37, pp. 2168–2172, fig. 1*).—A report of observations made by the author in Nigeria, where a colony of *H. hookeri* has been found to be well established.

## ANIMAL PRODUCTION

**Body size and metabolism,** M. Kleiber (*Hilgardia [California Sta.], 6 (1932), No. 11, pp. 315–353, fig. 1*).—This study was undertaken to determine whether or not there was a theoretical reason for maintaining the surface of the skin as the basis for comparing the metabolism of animals which differ in size. The four theories of the surface law, namely, temperature regulation, nutritive surface, composition of the body, and the rate of blood circulation, are discussed.

It has been demonstrated that the animal can vary its specific insulation to a considerable degree, but the possibilities of altering this insulation are practically limited. This theory is criticized because it gives approximate comparisons of the heat production of animals differing materially in size. Basing the surface law on nutritive surfaces has been shown to be without foundation. Differences in the composition of the body, though undoubtedly affecting metabolism, do not explain the considerable influence of body size on the metabolism of different kinds of animals. It was considered that the intensity of blood circulation was more closely related to a lower power of body weight than unity.

No theoretical evidence was found to indicate that the metabolism of animals should be related exactly to their surface area, and for precision the metabolism of an animal should not be given in terms of body surface because the term is not well defined.

The author believes that the heat production of warm-blooded animals should be expressed in terms of the same power of the body weight. A simple equation based on the ⅝ or ¾ power of body weight should be studied in an effort to find a unit for measurement which might be internationally adopted.

**A study of phosphatic limestone as a mineral supplement,** C. Tolle and L. A. Maynard (*New York Cornell Sta. Bul. 530 (1931), pp. 27, pls. 2, fig. 1*).—Using a technic previously reported (E. S. R., 58, p. 166), this study was undertaken using rats and pigs as the experimental animals to determine the influence of phosphatic limestone on growth and bone development. The influence of continuous feeding of this limestone on the reproduction and lactation of rats was studied, together with the physiological effect of the fluorine content of the limestone.

With growing rats the calcium of the phosphatic limestone was as well utilized as the calcium of bone meal or of limestone when measured by the ash content of the bones. The phosphatic limestone was also as satisfactory a source of calcium for growing pigs as a mixture of limestone and bone meal. When rats received diets containing 2 per cent or more of phosphatic limestone they showed teeth changes indicative of excess fluorine, but levels up to 5 per cent resulted in bone of normal ash content during a 35-day experimental period. Levels of phosphatic limestone ranging from 1.5 to 3 per cent were fed to a total of 26 pigs over a 4-months period with satisfactory results, and there was no evidence of teeth changes or of other pathological effects upon postmorten examination.

A group of rats fed phosphatic limestone from weaning reproduced and reared their young for 5 matings as well as a group fed ground limestone. Severe teeth changes occurred in this group, due apparently to the presence of fluorine, which was shown to have accummulated in the body of the rat.

Observations on 38 rats receiving varying levels of fluorine for periods as long as 500 days failed to show any enlargement of the thyroid gland.

**The nutritive value of gram husk,** F. J. Warth and L. C. Sikka (*India Dept. Agr. Mem., Chem. Ser., 11* (*1930*), *No. 5, pp. 85–99, fig. 1*).—A comparative feeding test showed that gram husk affected the ration in much the same manner as wheat bran. Both feeds improved the consistency and palatability of the ration and brought about approximately the same increase in food consumption and live weight. Digestion trials showed that gram husk had a distinctly lower starch value than wheat bran, and that the former feed was entirely lacking in digestible protein. Gram husk was not considered a concentrated feed in this study.

When the starch equivalent values of the mixed rations were compared with the observed nutritive effect, it was concluded that the relatively higher American values corresponded more closely to the effect observed in this study. Other data from the nutrition section at Bangalore showed that American values often gave close approximations to the observed nutritive effect.

**The nutritive values of some typical Indian hays,** F. J. Warth (*India Dept. Agr. Mem., Chem. Ser., 11* (*1930*). *No. 4, pp. 73–84, figs. 5*).—The chemical composition and digestibility of 30 typical Indian hays are listed. The difference in protein content of the samples. which varied from 1.96 to 18.16 per cent, was attributed to characteristics of species and to the stage of maturity. A graphic presentation of the data revealed that the digestibility of all ingredients was related to the protein content, and also that the digestibility of carbohydrates was sometimes seriously depressed through unknown causes.

**Influence of the method of curing kudzu hay on its vitamin A content,** W. E. Sewell and G. J. Cottier (*Alabama Sta. Rpt. 1931, p. 45*).—Kudzu hay samples were cured and dried in an oven at 60° C. for 5 hours and then ground. The vitamin A content was determined with rats when the hays were fed at levels of 0.0025, 0.005, and 0.0075 gm. per rat daily. The results indicated that in vitamin A potency shade-cured, cock-cured, and field-cured hays ranked in the order named.

**Feeding experiments at Hosur, 1926, 1927 and 1928,** F. J. Warth (*India Dept. Agr. Mem., Chem. Ser., 11* (*1930*), *No. 3, pp. 53–72, fig. 1*).—This study at the Hosur cattle breeding farm was undertaken to determine the nutritive value of spear grass fodders. The following products were considered: Prime hay, mature hay, early-cut hay, and spear grass silage. Digestion and feeding trials were conducted during the course of the study.

The silage was more readily eaten, produced greater increases in live weight, and its carbohydrates were more digestible than the mature hay. Early-cut hay was more readily consumed, caused a marked increase in live weight, and was more digestible than mature hay. The study showed that the silage was more suitable when large amounts of concentrates were fed and the early-cut hay when the concentrates were limited.

**[Experiments with beef cattle in Alabama]**, J. C. Grimes (*Alabama Sta. Rpt. 1931, pp. 22, 23, 24*).—The results of two studies are noted.

*Fattening steers on grass.*—In this test two lots of steers were fed on good Black Belt pasture. In lot 1 the pasture was supplemented with an average of 5.3 lbs. of cottonseed meal daily, and the cattle were marketed in June. Lot 2 received no supplements to pasture and were marketed in September. The initial weight per steer in lot 1 was 564 lbs., they were on pasture 77 days, consumed a total of 411 lbs. of cottonseed meal per head, and gained an average of 202 lbs. each. Lot 2 steers averaged 556 lbs. per head initial weight, were on pasture 168 days, and gained a total of 288 lbs. per head. The cost of 100 lbs. of gain was $4.12 and $1.04, and the selling price per hundredweight was $8.25 and $7 in the respective lots.

*Wintering stocker calves and yearlings and two-year-old stocker heifers.*—Continuing this work (E. S. R., 65, p. 459), a group of 93 Hereford calves fed a ration of 1.3 lbs. of concentrates and 4.3 lbs. of hay per head daily for 155 days during the winter gained 24.7 lbs. per head at a feed cost of $7.97 each. A group of 50 yearling heifers were wintered on pasture with access to haystacks and were fed cottonseed meal and hay for only 18 days. A group of 72 2-year-old heifers fed an average of 1.6 lbs. of cottonseed meal and 4.2 lbs. of Johnson grass hay per head daily for 94 days gained an average of 22.9 lbs. per head at a feed cost of $3.20 each.

**[Studies with sheep in Alabama]**, J. C. Grimes (*Alabama Sta. Rpt. 1931, p. 24*).—Two studies are noted.

*Feeding grain to lambs for the spring markets.*—Continuing this work (E. S. R., 65, p. 460), 176 lambs were divided into two equal lots, one of which received a grain mixture made up of corn meal, wheat bran, cottonseed meal, and salt plus pasture and mother's milk. The other lot received pasture and mother's milk only. The returns per lamb above feed and marketing costs were $4.67 and $4.50 in the respective lots.

*Docking and castrating lambs.*—The average price received for 86 docked and castrated lambs was $5.67 and for 90 similar lambs undocked and castrated $5.47.

**A manifold desiccating apparatus for determining the dry weight of small samples of wool**, J. E. Nordby (*Science, 72 (1930), No. 1857, pp. 120–122, figs. 2*).—In this paper from the Idaho Experiment Station the author describes an apparatus for driving the moisture from a small sample of wool.

**[Experiments with swine in Alabama]** (*Alabama Sta. Rpt. 1931, pp. 22, 23*).—Two studies are noted.

*Soybean hay as a supplement to white corn and tankage for growing and fattening hogs*, J. C. Grimes and W. E. Sewell.—A summary of four trials (E. S. R., 65, p. 460) showed that a ration of white corn, tankage, and soybean hay produced faster and more economical gains than a ration of white corn and tankage. However, when the ration consisted of yellow corn and tankage the gains produced were cheaper and faster than in either of the other groups.

The consumption of 19.8 lbs. of soybean hay per 100 lbs. of gain effected a saving of 21.3 lbs. of concentrates.

*White corn and various protein supplements for fattening hogs in dry lot*, J. C. Grimes, W. E. Sewell, and G. J. Cottier.—A basal ration of white corn and mineral mixture was fed to 4 lots of 10 pigs each in dry lot. In addition the respective lots received the following protein supplements self-fed: 60 per cent of tankage, 40 per cent of tankage, 40 per cent of commercial supplement, and "Alabama trinity" made up of 60 per cent of tankage, cottonseed meal, and kudzu meal 2:1:1. The average daily gains in the respective lots were 1.6, 0.8, 1.4, and 1.7 lbs. per head, and it required 350.3, 486.8, 398.5, and 345.5 lbs. of feed per 100 lbs. of gain, respectively.

**Swine performance record—litter comparisons, II**, C. C. CULBERTSON, H. H. KILDEE, M. D. HELSER, and W. E. HAMMOND (*Iowa Sta. Leaflet 28 (1932), pp. 8*).—Continuing this national cooperative study (E. S. R., 65, p. 63), data were gathered from 20 litters fed during the summer of 1931.

The range in average daily gain per pig was from 1 to 1.5 lbs. with an average for all litters of 1.3 lbs. The feed required to produce 100 lbs. of gain varied from 346 to 451 lbs. with an average of 396 lbs. The average value of wholesale cuts per 100 lbs. of live weight was $10.33 with a range of from $10.02 to $10.50. The average carcass score of all litters was 89.8 and the range was from 81 to 94 points.

**[Poultry studies in Alabama]**, G. A. TROLLOPE, D. F. KING, and C. T. BAILEY (*Alabama Sta. Rpt. 1931, pp. 45, 46*).—Two studies are noted.

*Efficient rations for laying hens.*—White Leghorn hens were divided into 6 pens of 40 birds each and were fed for a period of 7 months. Pens 1 to 5, inclusive, received a basal ration of yellow corn meal and a mineral mixture, and in addition the respective pens received skim milk to drink, meat scrap, ground oat groats and meat scrap, ground oats and fish meal, and ground oats and cottonseed meal. Lot 6 received a complex commercial egg mash. The average egg production in the respective lots was 107.1, 66.5, 69.6, 60.8, 69.9, and 80.3 eggs per bird. The percentage hatchability of eggs was 77.7, 61.4, 63.5, 61, 19.5, and 70.6 in the respective lots. Lot 1 made the highest return per bird over the feed costs and lot 5 the least.

In another phase of this study ground soybean hay compared favorably with alfalfa leaf meal as a supplement to either yellow or white corn.

*Simplified rations for chicks.*—A ration consisting of corn, shorts, buttermilk, and minerals gave as good results with chicks as a ration of corn, oat groats, shorts, buttermilk, meat scrap, linseed meal, alfalfa meal, and minerals. Using cottonseed meal in chick rations gave unsatisfactory results.

**The relationship between the first year egg production and the egg production of later years**, G. O. HALL and D. R. MARBLE (*Poultry Sci., 10 (1931), No. 4, pp. 194–203, fig. 1*).—Data available on 1,867 White Leghorns, 166 Barred Plymouth Rocks, 105 Rhode Island Reds, and 101 White Wyandottes at the New York Cornell Experiment Station were analyzed. All the birds in the White Leghorn flock were trap nested through three production periods. Many were continued for longer periods and five for a period of 11 years.

The analysis showed that in general chickens produced the greatest number of eggs during the first year of production and that after this year the decline from year to year was gradual and fairly regular, approximating 13 per cent for the White Leghorns. A significant correlation was found between first-year egg production and the production for the second, third, and fourth years. The correlation was not marked for the fifth and sixth years, and there was no correlation for later years. It was found that the birds which lived and produced for the longest period had the lowest average first-year production.

The rate of decline in egg production with age appeared to be more rapid in general-purpose breeds than in Leghorns. On the average the general-purpose breeds did not live so long nor produce so economically over so long a period as did the Leghorns.

**Effect of hormones on the formation of the hen's egg,** V. S. Asmundson (*Poultry Sci., 10 (1931), No. 4, pp. 157–165*).—In this study at the University of British Columbia laying hens were fed either follicular hormone or dessicated thyroid. Varying amounts of the hormone in a highly purified aqueous colloid solution containing about 30 rat units per cubic centimeter were injected into the birds at 8-hour intervals daily. Dessicated thyroid containing 0.2 per cent of iodine was fed in gelatin capsules once daily.

It was found that up to 2.25 cc. of the follicular hormone solution could be injected into a White Leghorn pullet without any apparent effect on the weight of eggs laid. It probably had no effect on the number of eggs, although one injected pullet stopped laying and one hen became broody. No toxic effects were noted following this treatment. When thyroid was fed at the rate of about 1 mg. of thyroid iodine per 1,750 gm. of body weight there was a loss in body weight in every case. In two birds whose internal organs were examined, the walls of the intestine were thickened and appeared to be congested, and in one bird the thyroid gland seemed to be inflamed and enlarged. The size of the egg laid by these birds was apparently reduced, and the yolk was consistently reduced in size. Within a short time after thyroid feeding started two of four birds stopped laying except spasmodically. In one case where human placenta was fed with the thyroid, egg production was resumed and the total weight of eggs and their parts returned to approximately normal.

**An analysis of egg weights,** F. J. Dudley (*Poultry Sci., 10 (1931), No. 4, pp. 184–193*).—This study was undertaken to determine the effect of different rations on egg production and on size of eggs, and to determine the value of certain feeds as sources of protein. The records were obtained from the National Institute of Poultry Husbandry, England, for the years 1927–1928. The study was divided into 12 periods of 4 weeks each. The eggs laid were weighed individually to the nearest dram.

The average weight of eggs laid by a bird was considered a "unit," and weighted averages for pens were compared with unweighted averages. The results showed that the correlation between the number of eggs laid by a bird in any month and their average weight centers around 0. The application of the analysis of variations to the study of egg weights is discussed in detail, together with information on a reliable estimate of error. The maximum use of the analysis of variations could be used only when there was at least duplication of data.

**The oil absorption of shell eggs,** T. L. Swenson and H. H. Mottern (*Science, 72 (1930), No. 1856, p. 98*).—The U. S. D. A. Bureau of Chemistry and Soils studied the problem of reducing shrinkage in eggs in cold storage. Eggs were dipped in oil, some at atmospheric pressure and others under a vacuum. The oils were colored with an oil-soluble dye to facilitate macroscopic examination.

The normal quantity of ether extract in unoiled shells and membranes was found to be approximately 1 per cent. With eggs dipped in oil at atmospheric pressure for 2 minutes the ether extract of the shells and membranes was about 10 times greater than in untreated eggs, and in eggs dipped under a vacuum of 50 mm. for 1 minute the amount was 18 times more.

Untreated and treated eggs were stored at 98° F. for 10 days and weighed at 48-hour intervals for shrinkage. The untreated eggs lost about 13 per cent of their total weight in 10 days, those dipped in oil at atmospheric pressure approximately 2 per cent, and those dipped under a vacuum only 0.5 per cent during the storage period.

**Studies in hatchability.—V, The inheritance of hatchability,** M. A. JULL (*World's Poultry Cong., London, Rpt. Proc., 4 (1930), pp. 172–178*).—In continuing this series (E. S. R., 64, pp. 622, 763), a study is reported of the correlation between the hatchability of the eggs laid by dams and their daughters in Rhode Island Red and White Leghorn flocks and in inbred White Leghorns and Barred Plymouth Rocks. The results indicated that hatchability was inherited, but there also appeared to be physiological factors affecting the results.

**Studies in hatchability.—VI, Hatchability in relation to current egg production,** M. A. JULL (*Poultry Sci., 10 (1931), No. 6, pp. 327–331*).—For this phase of the study data were taken from flocks of yearling and older Barred Plymouth Rocks, Rhode Island Reds, and White Leghorns at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md. For each breed there was approximately the same number of birds per pen and the same number of pens per year for 6 years. The breeding season each year lasted from February 10 to the last of March.

The mean percentage hatchability of all birds in all breeding pens was determined on the basis of two groups, one group including birds which laid from 10 to 19 eggs and the other group birds laying from 20 to 39 eggs during the 50-day period. In only one case was the difference in hatchability between two comparable groups significant, and no explanation was offered for this difference.

The records were again divided into two groups, one group including birds above the mean percentage hatchability of all the birds in the pen and the other group including birds below the mean percentage hatchability of the pen. The mean egg production for the breeding season was determined for each group in each pen. An analysis of the records showed that in the case of each breed, the mean egg production of the group having hatchability above the mean of the pen was higher in every case than in the group showing hatchability below the mean for the pen. The difference in mean egg production was significant in the case of the Rhode Island Reds and White Leghorns.

The results of the study show that heavy egg production during the breeding season not only was not detrimental but was apparently conducive to high hatchability.

**The influence of gravity and air-hunger on hatchability,** T. C. BYERLY and M. W. OLSEN (*Poultry Sci., 10 (1931), No. 6, pp. 281–287*).—The data for this experiment by the U. S. D. A. Bureau of Animal Industry were taken from 3 groups of eggs incubated to determine the rôle of gravity as it affects hatchability. One group of eggs was incubated with the large end up, another group horizontally, and the third group small end up. These positions were maintained for 18 days. Air hunger was also determined by incubating eggs partially coated with paraffin.

Of the eggs incubated large end up, 91.7 per cent produced chicks that were in a normal position for hatching, and 91.5 per cent of the eggs incubated horizontally had chicks in this position. Of the eggs incubated small end up, only 32.4 per cent of the chicks were in a normal position. In this latter case 59.7 per cent of the chicks had the head in the small end. This was over 17 times the number found in eggs incubated in a horizontal position and about

30 times the number found in eggs incubated with the large end up. The results demonstrated that gravity was a major factor in determining the position of the chick at hatching time.

When the large end of the egg was paraffined and the eggs were incubated with this end up, 48.9 per cent of the chicks were in normal hatching position, while the proportion with head in the small end was 27.3 per cent, and the proportion with head under right wing but with beak away from sac was 19.3 per cent as compared with 1 per cent in the controls. Eggs paraffined on the small end and incubated with the large end up differed little from control eggs. The eggs paraffined on the large end and incubated with the small end up showed 18.2 per cent of the chicks in a normal hatching position. The eggs paraffined on the small end and incubated with that end up showed only 33.3 per cent of the chicks with the heads in that end. These results also showed that air hunger was a factor in determining the hatching position of the chick. Malposition reduced but did not entirely remove the chances of a chick pipping and hatching.

**The occurrence of a pellagra-like syndrome in chicks,** A. T. Ringrose, L. C. Norris, and G. F. Heuser (*Poultry Sci., 10 (1931), No. 4, pp. 166–177, figs. 5.*)—Continuing this study (E. S. R., 65, p. 559) at the New York Cornell Experiment Station, the effect of purified casein and of egg albumin was determined. The casein was purified to obtain a more uniform product in respect to growth-promoting characteristics and to determine whether this might not increase the amount of paralysis. The egg albumin was thought to be deficient in the antiparalytic factor, but rich in vitamin $G_2$. The study was made with 7 lots of 25 chicks each, fed for 12 weeks, and in the case of some lots the feeding was duplicated.

The chicks receiving purified casein or egg albumin only made very slow growth, while lots receiving 2.5, 5, or 10 per cent of autoclaved yeast or 10 per cent of milk vitamin concentrate grew almost normally. Lots receiving commercial casein developed at an intermediate rate. The results show that the chick has an intense requirement for a heat-stable, growth-promoting factor present in the yeast and other food materials.

Nutritional paralysis appeared in all lots except the ones receiving 10 per cent of autoclaved yeast or dried egg albumin. The paralysis affected only a few chicks in the lots receiving milk vitamin concentrate and 5 per cent of autoclaved yeast. In addition to the symptoms already described, external lesions of a distinctly pellagrous nature appeared at about 3 weeks of age in the chicks receiving egg albumin, followed shortly by similar lesions in lots receiving purified casein, commercial casein, and commercial casein plus 2.5 per cent of autoclaved yeast. The lesions affected the eyes, mouth, and feet, and the condition also affected feathering and brought about inflammation and congestion of some of the internal organs. Mortality was high in some of the affected lots. These results indicate that vitamin G is not a single entity, but consists of at least two factors.

**Cost of raising pedigreed pullets and cockerels,** F. A. Hays and J. W. Locke (*Poultry Sci., 10 (1931), No. 4, pp. 178–182*).—In this paper from the Massachusetts Experiment Station the cost of raising pedigreed pullets and cockerels to approximately sexual maturity is discussed in detail.

## DAIRY FARMING—DAIRYING

**Feeding and management investigations at the United States Dairy Experiment Station at Beltsville, Md. 1930 report,** T. E. Woodward, J. B. Shepherd, and R. R. Graves (*U. S. Dept. Agr., Misc. Pub. 130 (1932), pp. 24,* *figs. 2*).—A new method of feeding grain to cows in milk is described which is based on the assumption that cows fed silage and all the medium to good quality hay they would consume need grain only when they produced more than a certain amount of milk. On this basis Jersey cows were fed 0.6 lb. of grain for each pound of milk produced above 10 lbs. and Holstein cows at the rate of 0.4 lb. for each pound of milk above 16 lbs. This method was applied to the other breeds as follows: Guernsey cows, 0.55 lb. of grain for each pound of milk above 12 lbs. and Ayrshire and Brown Swiss cows, 0.45 lb. of grain for each pound of milk above 14 lbs.

Cows were fed cottonseed meal in large quantities to determine whether there were any harmful effects. It appeared that this practice was harmless to the cows if good roughage such as pasture grass, green forage, or good quality hay was fed with the cottonseed meal.

Palatability tests with dairy cows showed that poultry bone meal was much more palatable than special steamed bone meal. Coarsely ground poultry bone meal was also more palatable than the same meal finely ground and also more palatable than raw bone meal.

In a test to compare the relative effects on the production of dairy cows of heavy and light feeding before calving, it was found that cows gained very little in weight during the two months of liberal feeding and that such feeding in itself did not lead to an increase in milk production.

Other studies reported in this publication include feeding hempseed meal, feeding beet pulp dry and wet, comparison of the consumption of different hays, variations in butterfat test from one milking to another, cooperative pasture experiments, and seasonal growth of pasture grass.

**[Dairy cattle experiments in Alabama]**, W. H. EATON (*Alabama Sta. Rpt. 1931, pp. 24, 25*).—Two studies are noted.

*Mineral supplements in the dairy ration.*—Continuing this work (E. S. R., 60, p. 173), the mineral supplements had no effect on the milk production or on the weight and size of the offspring of the cows in the original lots.

*Fly spray for dairy cows.*—In this test one row of cows was sprayed with a commercial fly spray for 2 weeks and then the opposite row was sprayed for a similar period. A preliminary period of 1 week preceded each test. During the test period of 168 cow weeks the nonsprayed cows produced 2.8 lbs. more milk per week than the sprayed cows.

**Ground soybeans and linseed oil meal for dairy calves**, J. H. HILTON J. W. WILBUR, and S. M. HAUGE (*Indiana Sta. Bul. 354* (*1931*), *pp. 8, figs. 4*).—Continuing this study (E. S. R., 65, p. 169), two tests covering 360 and 33 days, respectively, were conducted with two lots of eight calves each fed alfalfa hay and a grain mixture. In one lot linseed meal was used as the protein supplement and in the other lot ground raw soybeans replaced the linseed meal. The two supplements were equally effective in promoting growth.

**Calf feeding investigations.—II, Raising dairy calves on nurse cow, whole milk, remade skim milk, and home mixed calf meal**, M. H. BERRY (*Maryland Sta. Bul. 330* (*1931*), *pp. 13–30, figs. 5*).—This supplements a previous study (E. S. R., 63, p. 472), the conclusion given being essentially the same.

**The effect of low calcium, high magnesium diets on growth and metabolism of calves**, C. F. HUFFMAN, C. S. ROBINSON, O. B. WINTER, and R. E. LARSON (*Jour. Nutrition, 2* (*1930*), *No. 5, pp. 471–483, figs. 4*).—Experiments at the Michigan Experiment Station showed no bad effects from including from 3 to 5 per cent of magnesium salts in the ration of dairy calves. Instead of being detrimental, in every case the general health of the animals and the calcium and phosphorus retention were unaffected or improved.

In one case the addition of magnesium phosphate to the ration of a calf which showed the characteristic nervous disturbances ascribed to too much magnesium (E. S. R., 50, p. 275) brought relief. In another case the addition of this salt to a ration low in calcium and fairly high in phosphorus resulted in a marked improvement in body weight and health. In still another case of an animal on a low-calcium high-phosphorus ration, when magnesium was fed the animal most of the calcium of the ration was retained, but when the magnesium was discontinued the storage dropped to a negative state and the animal became stiff. The storage of phosphorus was identical with that of calcium.

Magnesium carbonate tended to reduce the loss of calcium and phosphorus in the feces and to a smaller extent to increase their excretion in the urine. The magnesium of the carbonate was mostly eliminated with the feces, though there was a slight increase in the urinary magnesium. Both carbonate and phosphate salts increased the storage of magnesium, but the former was apparently more effective.

**The changes in the total fatty acids, phospholipid fatty acids, and cholesterol of the blood during the lactation cycle,** L. A. Maynard, E. S. Harrison, and C. M. McCay (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 263–272, figs. 5*).—The changes in the blood plasma lipids of four Holstein cows prior to and during the period of lactation were studied at the New York Cornell Experiment Station. The samples were drawn from the jugular vein at intervals of from 5 to 10 days prior to parturition and for a short period thereafter, followed by sampling at less frequent intervals to the three-hundredth day after parturition. Records were kept of the milk yield and its fat content and of the feed consumed. The ration used was made up of mixed hay, silage, and a grain mixture.

The analyses showed that following parturition there was a rapid and approximately parallel rise in the total fatty acids, phospholipid fatty acids, and cholesterol constituents of the blood, followed by a gradual drop to the original levels as the succeeding dry period was reached. These results suggested a close metabolic relationship among the blood lipids. When animals were held at a constant level of food and fat intake during the dry period and early weeks of lactation, the same rise in blood lipids occurred following the initiation of milk secretion. This change indicated that lactation influences the level of blood lipids independent of any effect brought about by changes in fat intake.

**The interrelationship between the dietary fat and the phosphorus distribution in the blood of lactating cows,** C. M. McCay and L. A. Maynard (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 273–280, fig. 1*).—Cows were fed at the New York Cornell Experiment Station on grain mixtures containing approximately 1, 3, and 7 per cent of ether-soluble material (E. S. R., 66, p. 662). The grain ration was supplemented with alfalfa hay and beet pulp. The caloric values of the rations were equalized by replacing the fat removed from the high-fat grain mixture by the benzene process with an isodynamic amount of starch. Blood samples were taken from the jugular vein during the first, third, and last weeks of the 5-week experimental periods.

The milk and fat secreted were lower during the periods of lowered fat intake, and during such periods the phospholipids of the blood plasma and the total phosphorus of the plasma decreased. The phospholipids of the erythrocytes were unaffected, and there were no appreciable changes in other phosphorus constituents of the blood. It was evident that cows secreting large quantities of milk and fat were unable to synthesize enough fat in their bodies to allow maximum secretion by the mammary gland when the fat content of the ration was low.

**The influence of the ration of the cow upon the vitamin B and vitamin G content of milk,** C. H. Hunt and W. E. Krauss (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 631–638, figs. 4*).—In this study at the Ohio Experiment Station the data were obtained from two experiments, (1) a comparison of pasture grass and dry feed and (2) the influence of the stages of maturity of pasture grasses on the vitamin B and vitamin G content of milk.

The results of feeding the milk to rats showed that while the cows were on pasture their milk had a higher vitamin G content than when the cows were on dry feed. The quality of hay used in dry feeding may influence this factor. The vitamin B content of the milk was not so affected. Early pasture when it was in a vigorous state of growth caused a higher vitamin G content of milk than late pasture, and while the vitamin B content was not easily affected, there were indications that early pasture had a more favorable influence on its presence in milk than late pasture. These results indicate that rapidly growing plants synthesize vitamin G and that it is then dissipated as the plant matures.

**The influence of the fat-content on the keeping quality of milk,** H. Barkworth (*Jour. Min. Agr. [Gt. Brit.], 37 (1930), No. 8, pp. 803–806, fig. 1*).—In a study at the South Eastern Agricultural College, Wye, England, 4,002 samples of milk were divided into three classes—below 3 per cent of butterfat, from 3 to 4 per cent of fat, inclusive, and over 4 per cent of fat. The fat content was determined by the Gerber test. Keeping quality was estimated on the average hours of sweetness.

The results did not show any significant difference in the keeping quality of milk high in butterfat and that of milk with a lower fat content.

**Farm dairying, the handling of milk and cream,** L. A. Mosely (*Union So. Africa Dept. Agr. Bul. 85 (1930), pp. 17, figs. 2*).—In this bulletin from the Grootfontein School of Agriculture the author describes the handling of the milk and the care of the equipment with which the milk comes in contact.

**Lactobacillus acidophilus, an annotated bibliography to 1931,** W. D. Frost and H. Hankinson (*Milton, Wis.: Davis-Greene Corp., 1931, pp. 160*).—The authors have compiled abstracts of articles and books dealing directly with *L. acidophilus*, or with the intestinal flora of man and experimental animals which have an essential significance in connection with implantation.

## VETERINARY MEDICINE

**[Report of work in veterinary medicine]** (*Alabama Sta. Rpt. 1931, pp. 55, 56*).—A study was made by M. W. Emmel of the intestinal flora of naturally infected pullorum-positive chicks with particular reference to any relationship that might exist between *Salmonella pullorum* and organisms of the colon group. The colon organisms were found to constitute an unweighted average of 32.35, 38.02, and 63.35 per cent of the bacterial flora of the duodenum, middle portion, and cloaca, respectively, while in the same chicks *S. pullorum* constituted a corresponding average of 47.26, 47.61, and 19.63 per cent. The inoculation of 24-hour broth cultures of *S. pullorum* with colon organisms resulted in a reduction in the number of *S. pullorum* per cubic centimeter from 189,600,000 to 32,000,000 after 24 hours' incubation. In 15 chicks which recovered from pullorum disease, *S. pullorum* persisted in the feces of 13 chicks for 1 week, 8 chicks for 2 weeks, 3 chicks for 3 weeks, and 1 chick for 5 weeks after the climax of the outbreak.

Studies by Emmel and M. L. Boevers have shown that *Pasteurella avicida* and Brucella infections in the fowl can not be differentiated on the basis of the agglutination test alone since cross-agglutination exists between members of the Brucella and Pasteurella genera. The fowl, however, shows a marked response in the production of agglutinins when exposed to Brucella organisms, but the opposite is true when exposed to *P. avicida*. The agglutination test is thought to have some value in determining the presence of Brucella infection in a flock. Acute or subacute fowl cholera can be differentiated from Brucella infection in the fowl bacteriologically by distinct differences in the nature and course of the two infections, as well as by differences in the microscopic pathology produced by the causal organisms. Localized *P. avicida* infection can be differentiated from Brucella infection by the macroscopic pathology produced about the head of birds by the former infection. *P. avicida*, as a general rule being readily isolated from such lesions.

A study was made by Emmel of peritoneal tumors in the fowl, which, although not of common occurrence, are of importance due to their resemblance to the intestinal tubercles of tuberculosis. Such tumors occur on the serosa and vary in size up to 4 mm. in diameter, the mesentery being involved in some instances. Occasionally there may be a general thickening of the serosa with very little tendency to the formation of neoplasms, ruptured egg yolks and infestation with the tapeworm *Davainea proglottina* apparently being an exciting factor. In the cases studied the origin of such neoplasms were found to be in the mesothelium or in the subepithelial lymph channels.

**Thirteenth biennial report of the Kansas Live Stock Sanitary Commissioner, 1929–1930**, J. H. Mercer et al. (*Kans. Livestock San't. Commr. Bien. Rpt., 13 (1929–30), pp. 214, figs. 28*).—Included in this report are accounts of work with some of the more important infectious diseases and parasites of livestock.

**Annual report of the department of veterinary science and animal husbandry for year ending 31st December, 1930**, H. E. Hornby et al. (*Tanganyika Ter. Dept. Vet. Sci. and Anim. Husb. Ann. Rpt. 1930, pp. [1]+60*).—Much of part 2 (pp. 2–13), on disease control, and part 3 (pp. 14–51), on work of the veterinary laboratory at Mpwapwa, deals with control work with infectious diseases of livestock. The research work in part 3 is reported under the following headings: Rinderpest Research (pp. 16–30) and Note on Piroplasmosis (pp. 30. 31), both by R. L. Cornell and S. A. Evans; Research on Trypanosomiasis, by H. E. Hornby and H. W. Bailey (pp. 31–43); Notes on Goat Scab (pp. 43–46), Observations on *Oestrus ovis* L. (pp. 46, 47), Remarks on Stomoxys in Connection with Mechanical Transmission of Trypanosomes (pp. 47, 48), and Attempt to Transmit *T[rypanosoma] brucei* by *Hippobosca francilloni* Leach (p. 48), all by W. H. W. Baird; and Notes on Stock Feeding, by H. E. Hornby (pp. 49–51).

**Live stock diseases report, No. 6**, M. Henry (*N. S. Wales Dept. Agr., Live Stock Diseases Rpt., 6 (1929–30), pp. 18, fig. 1*).—This is a record of control work in New South Wales during the year 1929–30 (E. S. R., 63, p. 369).

**[The first report of the director of the Institute of Animal Pathology, University of Cambridge, 1929–30]** (*Cambridge Univ., Inst. Anim. Path. Rpt. Dir., 1 (1929–30), pp. XVI+237, pls. 14, figs. 28*).—The contributions relating to animal pathology here presented are as follows: Experiments on the Virus of Epithelioma Contagiosum (pp. 1–16) and Contagious Pustular Dermatitis of the Sheep and Goat (pp. 17–28) (E. S. R., 66, p. 466), both by R. E. Glover; Experiments to Determine Whether There Is a Filterable Form of the Tubercle Bacillus, by S. R. Gloyne, R. E. Glover, and A. S. Griffith (pp. 29–38);

Experimental Studies of the Pathogenicity of the Preisz-Nocard Bacillus for British Sheep (pp. 39–46) and A Note on *Vibrio foetus ovis* in the Ram (pp. 47–51), both by J. B. Buxton (see p. 873); Blackleg (Vaccination), by T. J. Bosworth (pp. 52–63) (E. S. R., 66, p. 466); *Bacillus oedematiens* Infection in Cattle, by T. J. Bosworth and L. Jordan (pp. 64–69) (E. S. R., 62, p. 562); Types of Tubercle Bacilli in Swine Tuberculosis, by R. L. Cornell and A. S. Griffith (pp. 70–76) (E. S. R., 63, p. 373); The Histopathology of Hypervitaminosis D, by J. R. M. Innes and L. J. Harris (p. 92); The Pathology of Hypervitaminosis D (pp. 93–107) and Arterio-Sclerotic Kidney (Primary Contracted Type) and Secondary Contracted Kidney in the Dog (pp. 108–113), both by J. R. M. Innes; A Study of the Blood of Cattle and Sheep in Health and Disease, by A. C. Fraser (pp. 114–204); and On a New Species of Labiostrongylus [*L. longispicularis*] (p. 205), A Note on *Rugopharynx australis* (Monnig, 1926) (pp. 206–208), Some New Parasitic Nematodes from Western Australia [*Macropostrongylus baylisi* n. sp., *Pharyngostrongylus woodwardi* n. sp., *Trichostrongylus dissimilis* n. sp., and *T. australis* n. sp.] (pp. 209–219), and Experiments on the Treatment of Parasitic Gastritis in Sheep and Lambs (pp. 220–237), all by W. A. Wood.

**Selected contributions from the Mukden Institute for Infectious Diseases of Animals** (*Select. Contrib. Mukden Inst. Infect. Diseases Anim., 1 (1930), pp. IV+242, pls. 11, figs. 57*).—The following contributions on animal pathology are here presented, pages 1–211 being in Japanese and the remainder in English:

Experimental Studies on the Tuberculin Hypersensitiveness, by K. Tsuge (pp. 1–24, 213) (E. S. R., 61, p. 569); Report of the Post-mortem Examination of Tuberculin-Reacting Cattle, by S. Yamagiwa and M. Yosikawa (pp. 49–71, 215, 216); On the Inagglutinability of Bacteria, by K. Tsuge (pp. 83–90, 217); On the Strains of the Glanders Bacillus, by K. Tsuge and T. Toyoshima (pp. 111–122, 219); Preliminary Note on the Experimental Infection with the Rinderpest Virus in Susliks, by T. Inoue, S. Harada, and T. Shimizu (pp. 123–139, 221, 222) (E. S. R., 63, p. 771); Studies on the Intraplantar Inoculation of Rabic Virus—I, Experiments with Virus Fixe, by K. Itabashi (pp. 141–153, 223, 224) (E. S. R., 63, p. 771); Studies on Contagious Pleuropneumonia in Cattle—I, On the Practical Value of Complement-Fixation Test Applying the Virus Culture as Antigen in the Diagnosis of Contagious Bovine Pleuropneumonia (pp. 155–180, 225, 226), and II, On the Correlation among the Morbid Changes of Lungs, the Cultivation of Virus, and the Complement-Fixation in Cases Naturally Infected (pp. 181–193, 227, 228), both by S. Yamagiwa, K. Itabashi, and S. Ito (E. S. R., 64, p. 379); The Life History of *Prosthogonimus putschkowskii* Found in the Vicinity of Mukden, South Manchuria—I, *Anax parthenope* as the Intermediate Host and Infestation Experiment with Male Fowl, by S. Ono (pp. 195, 196, 229–232) (E. S. R., 61, p. 574); *Gymnopleurus sinnatus* as the Intermediate Host of Spiruridae Found in the Vicinity of Mukden, South Manchuria—I, *Gymnopleurus sinnatus* as the Intermediate Host of *Spirocerca sanguinolenta* and Inquiry into Grassi's Experiment with *Blatta orientalis*, by S. Ono (pp. 197–199, 233–237) (E. S. R., 61, p. 676): The Life History of *Echinostoma campi* n. sp. Found in the Vicinity of Mukden, with Special Reference to the Second Intermediate Host, by S. Ono (pp. 201–208, 239, 240); and On the Blood Fluke, *Schistosomum turkestanicum* Skriabin, Detected in Manchurian Cattle, by S. Ono, T. Inoue, and T. Shimizu (pp. 209–211, 241, 242.)

**Veterinary obstetrics**, W. L. Williams (*Ithaca, N. Y.: Author, 1931, 2. ed., pp. XVII+482, pls. 4, figs. 101*).—This is a new edition of the work previously noted (E. S. R., 38, p. 78).

**Studies on protein-free suspensions of viruses, I, II** (*Brit. Jour. Expt. Path., 12 (1931), No. 3, pp. 172–182*).—Part 1 of this contribution, by I. J. Kligler and L. Olitzki, deals with the adsorption and elution of bacteriophage and fowl pox virus (pp. 172–177), and part 2, by Kligler, Olitzki, and M. Aschner, with cataphoresis experiments with protein-free suspensions of a bacteriophage and fowl pox virus (pp. 178–182). Experiments are reported indicating that with appropriate treatment it is possible to separate bacteriophage as well as fowl pox virus from the associated proteins.

**Mountain laurel and rhododendron as foods for the white tailed deer,** E. B. Forbes and S. I. Bechdel (*Ecology, 12 (1931), No. 2, pp. 323–333, figs. 4*).—This is an extended account of studies conducted in Pennsylvania, earlier accounts of which have been noted (E. S. R., 64. p. 174; 65, p. 177; 66, p. 844).

**The biological actions and the practical importance of thallium** [trans. title], A. Buschke and B. Peiser (*Ergeb. Allg. Path. Mensch. u. Tiere, 25 (1931), pp. 1–57*).—This review of the subject is accompanied by a list of more than 395 contributions.

**Bacteriology, especially determinative bacteriology, I, II,** K. B. Lehmann and R. O. Neumann (*New York: G. E. Stechert & Co., 7 ed., rev., 1930, vol. 1, pp. XX+172, pls. 65, figs. 3; 1931, vol. 2, pp. XII+868, figs. 43*).—This is an English translation of the seventh completely revised German edition of the work (E. S. R., 64. p. 260). Parts A and B of volume 1, translated by R. S. Breed, deal with technic and general determinative bacteriology (pp. 1–103), part C consisting of an atlas (pp. 105–172). Part 1 of volume 2, dealing with general bacteriology (pp. 1–174), and part 2, with special bacteriology (pp. 175–828), were translated by H. H. Boysen, P. A. Hansen, and W. Reiner-Deutsch and edited by R. S. Breed. The three appendixes in volume 2 deal with filtrable viruses (pp. 785–808), pathogenic Protozoa (pp. 809–825), and bacterial flora found in certain habitats (pp. 825–827).

**The serologic agglutination of Bacillus sordellii and Clostridium oedematoides,** I. C. Hall and A. L. Scott (*Jour. Bact., 22 (1931), No. 6, pp. 375–385*).—In studies conducted in continuation of those by Hall and his associates (E. S. R., 62, pp. 261, 667), it was found that there is a cross agglutination between all strains of *B. sordellii* and *C. oedematoides*. Sera prepared against *B. sordellii* or *C. oedematoides* do not cross agglutinate *B. sporogenes*, *B. tyrosinogenes*, or *B. novyi*. *B. sordellii* and *C. oedematoides* are therefore distinct serologically from other species of obligately anaerobic bacilli.

Reference is made to the recent report of studies of this organism by Vawter and Records (E. S. R., 65, p. 870).

**Nutritional poisoning caused by bacteria of the Salmonella group** [trans. title], A. Clarenburg (*Tijdschr. Diergeneesk., 58 (1931), No. 20, pp. 1098–1111; Ger., Eng., Fr. abs., pp. 1109–1111*).—This is a review of poisoning caused by bacteria of the Salmonella group in milk and meat.

**The growth of Br. abortus (bovine type) in shake tubes,** G. S. Wilson (*Brit. Jour. Expt. Path., 12 (1931), No. 3, pp. 152–165*).—The author found that in agar shake cultures incubated aerobically $CO_2$-sensitive strains of the bovine type of *Brucella abortus* grow in the form of a band situated about 2 to 5 mm. below the surface. "The first part of the paper is concerned with providing an explanation for this zone phenomenon of growth. In order for growth to occur, both oxygen and $CO_2$ are required. The oxygen diffuses into the medium from the air; the $CO_2$, it is believed, is mostly derived from the inoculated organisms themselves before actual growth commences. Growth first begins in a zone situated as near the surface as is compatible with the existence of an adequate concentration of $CO_2$. Growth does not occur at or immediately below the surface, because the $CO_2$ liberated from the organisms diffuses too rapidly into the air of the tube; nor does it occur low down in the medium, because the oxygen diffusing into the agar is used up by the organisms near the surface, so that the conditions below the band of growth are practically or completely anaerobic.

"In the latter part of the paper, additional evidence is advanced to support the essential truth of this conception. It is shown that the amount of growth and the position of the band are altered by variations in the size of the inoculum, in the reaction of the medium, and in the gaseous conditions under which the cultures are incubated, in a manner which is in harmony with the explanation offered. The double zone phonomenon, originally described by [B.] Bang, is considered, and reasons are brought to doubt the truth of Bang's deductions of the existence of two optimum oxygen pressures for growth."

**The effect of pasteurizing temperatures on (A) Brucella abortus and (B) Brucella abortus agglutinins in milk**, M. T. BARTRAM (*Cornell Vet., 21 (1931), No. 4, pp. 360–367*).—A review of the literature and experiments conducted show that "certain porcine strains of *B. abortus* may not be destroyed by heating to 140° F. for 20 minutes, to 142° for 30 minutes, nor to 145° for 15 minutes. The bovine strains of *B. abortus* used appear to be slightly less resistant to heat than the porcine strains. A positive correlation of 90 per cent may be obtained between animal inoculation and cultural methods for the isolation of *B. abortus*. Tests for agglutination and culture isolation of porcine and bovine strains of *B. abortus* may be positive in 3.2 per cent of the cases following inoculation and 5 weeks' incubation in guinea pigs in which no visible lesions were noted."

Experimental work on the effect of heat led to the following conclusions: "*B. abortus* agglutinins in milk may not be affected by heating to 140 or 145° for 30 minutes. At higher temperatures a gradual reduction in titer may occur. *B. abortus* agglutinins in milk may be destroyed by heating to 170° for 10 minutes. The destruction of *B. abortus* agglutinins by heat appears to take place more slowly in high than in low titer milk."

**Complement binding properties of Brucella abortus of bovine and porcine origin**, S. T. WALTON (*Jour. Immunol., 22 (1932), No. 1, pp. 19–40, figs. 7*).—In the author's studies the greatest variation in the complement binding ability of antiporcine and antibovine sera, as measured by a number of porcine and bovine antigens, was 0.002 cc. "This difference occurred after the antibody content of the blood had declined considerably. At the peak of antibody production, and for a period of about 12 days before and a like period after the zenith was reached, there was a difference of only 0.0005 to 0.0008 cc. There was a difference in the rate of production of antibacterial antibodies, and also a difference in the height of production as induced by the different strains of organisms, but in each case both the rate and height of production of antibodies in a given animal for both types of antigen was practically the same.

"The amount of agglutinating antibodies present in a given sample of antiserum, whether it was antiporcine or antibovine, was apparently as great for one type of antigen as for the other. When there was a variation of antibody content in a sample it was not constant for either type of antigen, but showed a difference for different strains of both types. In the absorption of agglutinins no antigen took appreciably more antibodies out of a serum for itself than it did for the other antigens, and the small variation in the absorbing power was not constant for either type of antigen.

"It appears from this investigation that complement fixation as a means of detecting *B. abortus* antibody is on a par with the more widely used method of agglutination. No particular advantage can be claimed for it over agglutination, but, as is the case with any serologic test when the laboratory report conflicts with the clinical evidence, or when clinical signs are wanting as is often the case in dealing with these organisms, an additional test, detecting a different type of antibody, might often be advisable as a confirmatory measure."

**Contribution to the study of the pathology and morbid histology of human and bovine onchocerciasis,** A. S. Mohammed (*Ann. Trop. Med. and Parasitol., 25 (1931), No. 2, pp. 215–298, figs. 11*).—Following an introduction and historical review (pp. 215–235), the author deals with the subject under the headings of *Onchocerca gibsoni* and some other bovine species (pp. 235–246), examination of material (pp. 246–250), pathology of *O. gibsoni* tumor (pp. 250–252), the genesis of the tumors in onchocercal disease (pp. 252–259), the histogenesis of the onchocercal tumors (pp. 259–261), the secondary changes which may take place in the adult tumors (pp. 261–263), analogy of the type of tissue reaction exhibited in onchocercal tumors to those excited by schistosomiasis and filariasis (pp. 263–266), the helminthic toxins (pp. 266–269), the infective granulomata and the helminthic deposits in the tissues (pp. 269–272), the pathological manifestations excited by *O. volvulus* other than the tumors (pp. 272–278), *O. caecutiens* (pp. 278–283), comparison between the tumors due to *O. volvulus* and *O. gibsoni* (pp. 284–286), and the eosinophile cell in helminthic infections (pp. 287–294). A list of 69 references to the literature is included.

**The transmission of human and bovine onchocerciasis,** A. S. Mohammed (*Ann. Trop. Med. and Parasitol., 25 (1931), No. 3–4, pp. 509–519*).—A historical review of the knowledge of *Onchocerca volvulus*, which attacks man, is followed by accounts of *O. gibsoni*, which attacks the bovine, endemic centers of human Onchocerca, endemic centers of animal Onchocerca, and distribution of the Simulium in the endemic centers of human and bovine Onchocerca.

**Critical experiments with carbon disulphide in the treatment of habronemiasis,** W. H. Wright, J. Bozicevich, and P. C. Underwood (*Jour. Roy. Army Vet. Corps, 2 (1931), No. 2, pp. 66–70*).—In experimental work here reported the authors have found that carbon disulfide administered in doses of 24 and 12 cc. to two animals weighing respectively about 800 and 500 lbs., preceded by a preliminary washing of the stomach with from 8 to 10 liters of a 2 per cent $NaHCO_3$ solution, resulted respectively in efficacies of 98.5 and 100 per cent in the destruction of *Habronema muscae*. *H. megastoma* in a stomach tumor was not affected by the treatment. Carbon disulfide administered in respective doses of 24 and 16 cc. without preliminary lavage to two animals each weighing about 800 lbs. gave indicated efficacies of 98.5 and 68 per cent, respectively, against *H. muscae*. The irritation to the gastric mucosa caused by the carbon disulfide was most severe in the two animals not receiving the sodium bicarbonate solution, indicating that the latter exerts a protective influence.

The authors consider carbon disulfide to be without doubt an effective anthelmintic for the destruction of *H. muscae*, and the efficacy of the drug is apparently enhanced by a preliminary washing of the stomach with an alkaline solution. While no specimens of *H. microstoma* were present in the test animals, tests with other drugs, the results of which will be published elsewhere, indicate that this species is no more refractory to treatment than is *H. muscae*.

**Tuberculosis of animals** [trans. title], R. Helm, K. Nieberle, F. Gerlach, and K. Beller (*Ergeb. Allg. Path. Mensch. u. Tiere, 25 (1931), pp. 563–905*).—

In this digest the subject is reviewed, with 1,064 references to the literature, as follows: General Account of the Exciting Cause of Mammalian Tuberculosis, by Helm (pp. 563–630); Pathological Anatomy and Pathogenesis, by Nieberle (pp. 631–812); Allergical Diagnosis of Tuberculosis in Veterinary Medicine, by Gerlach (pp. 813–868); and The Serodiagnosis of Tuberculosis of the Domestic Animals, by Beller (pp. 869–905).

**Comparison of the Huddleson slide test with a macroscopic tube test in undulant fever,** H. Welch and F. L. Mickle (*Jour. Lab. and Clin. Med., 17 (1931), No. 1, pp. 67–71, fig. 1*).—In a series of 156 specimens of blood tested for the presence of agglutinins for undulant fever, the Huddleson rapid slide method (E. S. R., 59, p. 78) was found slightly more specific and sensitive than the macroscopic tube test. Titers as low as 1:100 dilution in positive cases occurred in one case only with the tube test, and the Huddleson test in all positive cases showed typical agglutination in the 1:1,000 dilution or higher.

**Investigations on the pathogenicity of vesicular stomatitis virus,** K. Wagener (*Cornell Vet., 21 (1931), No. 4, pp. 344–359*).—This is a report of investigations of vesicular stomatitis virus conducted in 1930–31 at the U. S. D. A. Bureau of Animal Industry Experiment Station at Bethesda, Md., in which horses, cattle, hogs, sheep, goats, cats, rabbits, white and wild rats, white mice, chickens, and pigeons were used.

It was found that while the disease could not be transferred by contact among cattle, the infection was transmitted in this way in little pigs. "Two out of seven little pigs died from an artificial or contact infection, showing the virus in the heart muscle, without visible lesions. Sheep and goats were successfully inoculated with the Indiana and the New Jersey strain. Cats proved to be only slightly susceptible to vesicular stomatitis; only one out of five cats could be locally inoculated. The susceptibility of rabbits also proved to be very minor. Only one out of eighteen rabbits inoculated in the mouth, and none out of seven inoculated in the cornea, showed lesions. White rats, especially those weighing between 180 and 200 gm., proved to be desirable experimental animals when the inoculations were made intracutaneously. White rats develop no generalized lesions. Wild rats also were found to be very susceptible. White mice did not show positive lesions after artificial inoculation, but it seemed that they can retain the virus for at least several days. Chickens and pigeons proved to be not susceptible to vesicular stomatitis."

**The occurrence of cysticercosis (inermis) in the Netherlands** [trans. title], K. Reitsma (*Tijdschr. Diergeneesk., 58 (1931), No. 19, pp. 1026–1046; Ger., Eng., Fr. abs., pp. 1045, 1046*).—A report of the occurrence of cysticercosis, the so-called measles of cattle, in the Netherlands, based upon studies made in the abattoir of Rheden where the percentage was 3.3 per cent in 1929 and 5.6 in 1930. A list of 30 references to the literature is included.

**The bacteriology of chronic streptococcic mastitis,** J. M. Rosell (*Cornell Vet., 21 (1931), No. 4, pp. 317–333*).—Following an introduction and account of the microscopic examination of the sediment of milk from infected udders, including (1) morphological changes of mastitis streptococci grown on different media, (2) the most suitable culture media for the growth of mastitis streptococci, and (3) biological characteristics of mastitis streptococci isolated during the studies, a summary is given of comparative cultural characteristics of the most important types of streptococci frequently found in milk, followed by a discussion of virulent forms. In considering therapeutics, vaccination is thought to be perhaps the most effective treatment, especially if associated with milk or protein injections and frequent milking. Vaccination conducted during a single year with 168 diseased cows in combination with weak formalin milk injections and frequent milking (from three to five times a day) was found 77 per cent effective. The author used polyvalent autovaccines from cows of the same stable, cultures used for the first injection having been killed by heating 20 minutes at 55° C. For the following injections live cultures were added to from 40 to 60 cc. of milk heated one-half hour at 60°.

**The host specificity of Haemonchus contortus of sheep and cattle,** I. C. Ross (*Aust. Jour. Expt. Biol. and Med. Sci., 8 (1931), No. 4, pp. 217–224*).—The author finds that while lambs may be readily parasitized by *H. contortus* larvae of ovine or bovine origin, it is with difficulty that calves are parasitized with *H. contortus* larvae of ovine origin. In view of the low susceptibility of calves to infestation with sheep Haemonchus, the use of cattle for the reduction of infestation of pastures with the parasite may be advocated.

**On the manner of transmission of Moniezia expansa, the common tapeworm of the sheep,** H. R. Seddon (*Ann. Trop. Med. and Parasitol., 25 (1931), No. 3–4, pp. 421–429*).—In studies conducted in New South Wales the author found that the transmission of *M. expansa* is not directly from sheep to sheep by contact, but that infested sheep contaminate the ground by their feces and susceptible sheep become infested by later grazing over such an area.

"The nature of the soil covering plays no essential part. Neither permanent water nor grass appear to be necessary. If an encysted stage occurs, such may apparently take place on litter (chaff and leaves). Herbage cut from an infective area and fed may be followed by infestation. As no recognizable invertebrate was present in such cut herbage, it would appear that if the ingestion of the intermediate host is necessary such host must be minute in size. An intermediate host may or may not be necessary. If it is, it is suggested that the larvae leave it and that the infective stage is a free stage, perhaps encysted. As direct feeding of fresh ova is not followed by infestation (Mönnig, 1929 [E. S. R., 63, p. 171]), it would appear that extraovine development of the ova is necessary before an infective stage is reached, and it is thought probable that this may take place without the intervention of an intermediate host. It has been shown that ground may be infective for at least 11 months after infested sheep have grazed upon it. Infective ground has been shown to be infective in midsummer, autumn, and early winter."

**The development in sheep of immunity to Moniezia expansa,** H. R. Seddon (*Ann. Trop. Med. and Parasitol., 25 (1931), No. 3–4, pp. 431–435*).—The author has found in connection with the studies above noted that lambs which have recovered from an infestation with *M. expansa* are immune to reinfection from grazing over infected ground. In a single experiment immunity was conferred by drenching an emulsion prepared from freshly secured ripe proglottides, but did not follow the subcutaneous inoculation of a similar emulsion which had been carbolized and stored for 11 days. "In those cases where reexposure to infection was not followed by infestation, the interval between last appearance of ova in the feces and date of reexposure has been 21 days, 26 days, 7 months, and 1 year, in the respective experiments. Where immunity followed drenching with fresh proglottides, such drenching took place 86 days prior to exposure to reinfection. It would appear, therefore, that immunity is developed certainly within 6 weeks of the primary infestation reaching maturity, and, from the fact that, apparently, superinfestation does not occur, at an even earlier period. The facts suggest that immunity is local and concerns the intestinal mucous membrane."

**On the life of Moniezia expansa within the sheep,** H. R. Seddon (*Ann. Trop. Med. and Parasitol., 25 (1931), No. 3–4, pp. 437–442*).—In connection with the studies above noted, it was found that the duration of the parasitic existence of *M. expansa* in the sheep is about 65 to 70 days, though individual parasites may live to about 75 days; that they take from 40 to 50 days to reach maturity; and that egg laying continues for from 20 to 30 days.

**A note on Vibrio foetus ovis in the ram,** J. B. BUXTON (*Cambridge Univ., Inst. Anim. Path. Rpt. Dir., 1 (1929–30), pp. 47–51, pl. 1; also in Vet. Rec., 12 (1932), No. 5, pp. 117–119*).—The observations here reported indicate that the ram studied harbored in his body a vibrio capable of producing abortion in healthy pregnant ewes when introduced under experimental conditions. There was also circumstantial evidence suggesting that the ram was capable of disseminating infection with the vibrio under natural conditions.

**The epidemiology of fowl cholera.—VI, The spread of epidemic and endemic strains of Pasteurella avicida in laboratory populations of normal fowl,** I. W. PRITCHETT and T. P. HUGHES (*Jour. Expt. Med., 55 (1932), No. 1, pp. 71–78*).—In further experiments (E. S. R., 62, p. 670) the authors have found that strains of *P. avicida* from spontaneous epidemics of fowl cholera, when introduced intranasally in fixed doses into specially bred chickens, induced fatal fowl cholera in about 40 per cent but did not survive in the nasal clefts of resistant birds nor spread to normal contacts. Strains of *P. avicida* from spontaneous epidemics of fowl cholera, when introduced similarly into chickens, failed to kill but did survive in the nasal clefts of inoculated birds and spread readily to normal contacts. Laboratory variants of the epidemic strains of *P. avicida* failed to kill or survive in the test birds and did not spread to contacts.

**Infectious laryngotracheitis carriers,** C. S. GIBBS (*Massachusetts Sta. Bul. 278 (1931), pp. 163–173, figs. 3*).—This is a progress report (E. S. R., 65, p. 474) of investigations during the year of infectious laryngotracheitis, centered largely around carrier problems and control measures. It was found that sparrows and mice which occur about the poultry house are not important mechanical carriers of the infection. The same appears to be true of the pigeon, since 10 that were inoculated intratracheally with virulent strains of infectious laryngotracheitis failed to contract the disease or to carry the virus in their tracheas for any great length of time. It is pointed out that man may serve as a mechanical carrier of the virus, when birds are handled in the acute stages of the disease, to susceptible chickens, pullets, or cockerels. It was found that acute cases eliminate the virus as long as they live, up to 10 or 15 days, or until they show no visible symptoms of the disease. Fourteen chronic carriers out of 504 birds tested eliminated the virus for indefinite periods. The number of chronic carriers in a flock surviving an attack of the disease depends upon the size of the flock and the virulence of the virus.

If the birds used for breeding purposes have had infectious laryngotracheitis and the pullets and cockerels have remained free of it, the two flocks should be kept separate in order to break the cycle of infection and get rid of the disease. The respiratory tract seems to be the most important channel of infection. It is pointed out that summer is usually the best time to clean up and disinfect after an outbreak.

**A study of cross-immunity with viruses of fowl-plague and observations on the duration of immunity,** H. S. PURCHASE (*Brit. Jour. Expt. Path., 12 (1931), No. 3, pp. 199–201*).—In work at the Ministry of Agriculture Veterinary Laboratory at Weybridge, in which seven strains of fowl plague virus were used, no evidence was found of the occurrence of immunologically different types. It was found that fowls known to be able to resist inoculation with fowl plague virus may, after a lapse of 32 days or more, succumb to fowl plague if then inoculated intramuscularly with the virus.

**The electrical charge of the virus of fowl-pox and the agent of the rous sarcoma**, G. M. Findlay (*Brit. Jour. Expt. Path., 11 (1930), No. 3, pp. 190, 191*).—In the application of the so-called "blotting paper" method of determining the electrical charges carried by virus particles, described by S. P Bedson and J. O. W. Bland in 1929,[3] the virus of fowl pox was negatively charged at pH 6.6 to 8, that of the rous sarcoma at pH 5.6 to 8.

**Diseases of poultry in the Netherlands** [trans. title], F. A. de Zeeuw (*Tijdschr. Diergeneesk., 58 (1931), No. 19, pp. 1047–1058, figs. 3; Ger., Eng., Fr. abs., pp. 1057, 1058*).—The author here reviews the occurrence of poultry diseases in the Netherlands, giving the percentages of those responsible for the death of 1,737 hens examined.

**An avian disease new to the Philippines**, A. K. Gomez (*Philippine Agr., 18 (1930), No. 8, pp. 505–511, figs. 5*).—This is an account of a disease of fowls new to the Philippines and found to be caused by a filtrable virus. The symptoms found in affected birds are inappetence, marked dopiness, irregular temperature, gasping for air, mucous discharge from the nasal passages and mouth, diarrhea, and in resistant birds paralysis of the legs. The course of the disease is said to be short, death taking place soon after acute symptoms appear. The affection resembles Newcastle disease as described by Doyle in England (E. S. R., 58, p. 77).

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations at the Alabama Station]** (*Alabama Sta. Rpt. 1931, pp. 11–13*).—In experiments by E. G. Diseker with machinery for planting oats, a combination involving an end-gate seeder, 2-mule wagon, 8-ft. wheatland plow, and a 15–30 tractor was the most economical of fuel and labor of four different combinations of equipment. The yield of oats was as good with this as with any of the other methods.

In weed control studies, Diseker found in tests of the rotary hoe for the cultivation of young corn and cotton that the implement could be used profitably on black belt and sandy soil. It also was found to be a desirable implement for the precultivation of sandy soil just before planting.

The use of a 1-horse spring tooth weeder to break crusts on cotton just coming up aided in getting up a stand of cotton and gave a light cultivation for the young crop in the row and middles.

In a continuation of the soil dynamic studies (E. S. R., 66, p. 378), M. L. Nichols found the abrasive power of soils to depend upon the sand content, other soil properties apparently exerting little or no effect. He also found that the injurious puddling effect of pressure varies with the colloidal content of the soil, and that a sliding motion of the surface applying force results in greater puddling injury than when the pressure is applied directly.

Laboratory studies of the draft of implements in various soils showed that draft is proportional to the depth at which the implement operates in the soil and depends upon the shear value of the soil. It also is proportional to the apparent specific gravity of the soil. The effect of the slope of the surface of tillage implements on draft was found to be governed by the general laws of the inclined plane.

The tentative conclusions drawn from soil erosion studies by Nichols and H. Sexton were that the relation of rainfall to run-off and amount of material eroded is governed by amount and rate of rainfall, moisture content of soil before rain, soil structure, surface protection, and surface shape. The results are taken to indicate that the critical velocity of rain water on Cecil clay soil is reached on grades between 10 and 15 per cent.

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[3] Brit. Jour. Expt. Path., 10 (1929), No. 1, pp. 67–70, figs. 3.

Tabular data are presented showing the relation of surface protection and structure of soil to erosion.

**Surface water supply of the Great Basin, 1930** (*U. S. Geol. Survey, Water-Supply Paper 705 (1931), pp. V+92, fig. 1*).—This report, prepared in cooperation with the States of Utah, Nevada, California, Oregon, and Wyoming, presents the results of measurements of flow made on streams in the Great Basin during the year ended September 30, 1930.

**Surface water supply of Hawaii, July 1, 1927, to June 30, 1928** (*U. S. Geol. Survey, Water-Supply Paper 675 (1932) pp. V+105*).—This report, prepared in cooperation with the Territory of Hawaii, presents the results of the year's measurements of the flow of streams and ditches in the Territory.

**Seepage and drainage of irrigated land,** H. E. Murdock (*Montana Sta. Bul. 255 (1932), pp. 32, figs. 24*).—This bulletin presents the results of investigations of the injurious results of seepage on irrigated lands and of ways and means of correction and control. It is pointed out that most of the drainage problems of Montana occur in those regions where there are underlying strata of porous material through which gravity water readily passes.

It was found that a lumber-box drain lasts well in water-soaked soil, and that where the soil is likely to be washed away from underneath the drain a closed bottom box is feasible. It also was found that surface water should not be allowed to run over the drain line, and that a sump that can be cleaned out should be used where necessary to admit surface water into the drain. Irrigation water should be carried over the drain line in a flume.

Much general information of a practical character is given on the planning and installation of drains in seeped and water-logged lands.

**Farm underdrainage,** F. L. Ferguson (*Ontario Dept. Agr. Bul. 360 (1931), pp. 16, figs. 15*).—Practical information is given on the planning and construction of underdrainage systems, together with materials and unit costs for several different systems, including the herringbone and gridiron.

**Strip cropping to prevent erosion,** H. V. Geib (*U. S. Dept. Agr. Leaflet 85 (1931), pp. II+6, figs. 5*).—Practical information is given on strip cropping for erosion prevention. This practice consists of planting strips of densely growing or fibrous rooted crops between strips of clean tilled crops along the contours of erosive slopes.

It has been found that strip crops preserve terrace lines previously surveyed until it is possible to construct the terraces. They also reduce run-off and erosion and increase the penetration of rain water into the soil. Under certain conditions, especially where the land is gently sloping or where the rainfall is light, strip cropping may be substituted for terracing.

**Earth pressure tables** [trans. title], E. R. Schubert (*Bauingenieur, 11 (1930), No. 7, pp. 113, 114, figs. 3; abs. in [Gr. Brit.] Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 4, p. 139*).—Tables based on Coulomb's theory of earth pressures are given for facilitating the calculation of the earth pressure, the pressure on the wall, and the moment at the heel of L-shaped retaining walls under various types of loading.

**Experiments on the strength of joints in timber structures** [trans. title], O. Graf (*Bauingenieur, 11 (1930), No. 16, pp. 277–282, figs. 26; abs. in [Gr. Brit.] Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 7, p. 255*).—Tests conducted at the Technical Academy of Stuttgart, Germany, on the strength of joints of timber structures are reported.

The results indicate that the reductions in load for the increase in the angle between the direction of the load and the grain, required by the regulations of the German Railway Company, are too great. These regulations specify maximum compressive stresses for soft woods according to the angle between the direction of the load and of the grain as follows: 80, 48, 24, and 15 kg. per square centimeter (1,140, 680, 340, and 214 lbs. per square inch) for angles of 0, 30, 60, and 90°, respectively.

The test specimens are illustrated by dimensioned drawings and photographs taken after failure, and the results are fully presented in tables and graphs.

**Bending tests on dowelled wooden beams** [trans. title], O. Graf (*Bauingenieur, 11 (1930), No. 10, pp. 157–160, figs. 21; abs. in* [*Gr. Brit.*] *Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 4, p. 134*).—An illustrated description is given of bending tests conducted at the Technical Academy of Stuttgart, Germany, to compare the deflections of dowelled beams under given loads with those of solid beams of the same dimensions and similar wood, and to determine the ultimate strength of such beams and of dowelled connections.

The data obtained are presented in tabular and graphic form, and the condition of some of the beams after failure is shown by photographs. The deflection of the dowelled was always greater than that of the corresponding solid beams, and the ultimate strength of the former varied between 78 and 96 per cent of that of the latter. In no case was failure due to shearing of the dowels.

**Compressive and bending tests on solid and built-up wooden struts** [trans. title], O. Graf (*Forschungsarb. Geb. Ingenieurw., No. 319 (1930), pp.* [*2*]*+14, figs. 86; abs. in Ztschr. Ver. Deut. Ingen., 74 (1930), No. 4, pp. 121, 122, figs. 13;* [*Gr. Brit.*] *Dept. Sci. and Indus. Research, Bldg. Sci. Abs., n. ser., 3 (1930), No. 4, p. 134*).—Data are reported which were obtained from compressive and bending tests on solid and built-up wooden struts. It was found that the elastic modulus of soft woods free from knots varies between 140,000 and 70.000 kg. per cubic centimeter (between 890 and 445 tons per square inch). It is recommended that compression tests be carried out on square prisms three times their width in height and of a size appropriate to practical conditions.

Comparative bending tests on solid and laminated beams showed that the friction on which the horizontal shear resistance of the latter depended was not constant, and that bolted connections were not sufficient to develop the full strength of a solid beam of the same material and dimensions. The effects of various methods of connecting the longitudinal members and of the slenderness ratio are illustrated by curves.

**Public Roads, [February, 1932]**, (*U. S. Dept. Agr., Public Roads, 12 (1932), No. 12, pp. 293–308+*[*2*]*, figs. 16*).—This number of this periodical contains the current status of Federal-aid road construction as of January 31, 1932, together with the following articles: Some Studies of Drilling and Blasting in Highway Grading, by A. P. Anderson (pp. 293–302, 308); and Effect of Type of Breaking Machine on the Modulus of Rupture of 6 by 6 Inch Concrete Beams, by O. K. Normann (pp. 303–308).

**A comparative study of alcohol, gasoline, and kerosene, as fuels for tractor engines,** A. L. Teodoro (*Philippine Agr., 20 (1931), No. 5, pp. 295–327, figs. 10*).—Studies which involved 157 tests were conducted at the New York Cornell Experiment Station. Straight alcohol of different percentages and diluted and undiluted denatured alcohol were used instead of motor alcohol fuels which are of variable composition. No attempt was made to increase the heating value of the fuel by the addition of ether, gasoline, or kerosene.

The engines used were of commercial tractor types and included 2 rated at 15 to 30 h. p., 1 rated at 15 to 25 h. p., and 1 rated at 10 to 20 h. p.

The dynamometer used was of the hydraulic type and could absorb a maximum of 150 h. p. at from 1,200 to 4,000 r. p. m. Observations were made of temperatures of all controlling factors, fuel consumption, and brake thermal efficiencies.

Water injection was found beneficial in tractors of the McCormick-Deering type when either gasoline or kerosene was used. The consumption was very much reduced from beginning half load to as high as the engine could develop. Injection of water increased the volumetric efficiency and lowered the radiator temperature at these loads. The maximum power developed was increased, and knocking due to overheating of the engine was minimized. More injection water was consumed per brake horsepower hour when using gasoline than when using kerosene. The use of injection water is recommended for Cletrac "K" and Fordson types from about half load to normal capacity using gasoline and kerosene.

The experiments also proved that tractor engines originally designed to run with gasoline or kerosene can also be run with straight alcohol of different strengths and with diluted and undiluted denatured alcohol.

With the exception of the Fordson tractor, enlargement of the carburetor jet was found necessary in all tests using alcohol to admit enough fuel to carry the load. This extra fuel was needed because the compression ratio was not increased and no additional substance was added to the alcohol to increase its heating value.

Some tests showed that at or near the maximum load, the ignition points were retarded a few degrees from the maximum position to get the best running condition and most economical consumption. The point of ignition at which the best tests were made on a certain load was a little earlier for alcohol fuels than for either gasoline or kerosene.

The consumption of fuel per brake horsepower hour was greater for alcohol fuels than for either gasoline or kerosene. The higher the percentage of alcohol the less was the consumption per given load. The most economical points for gasoline and kerosene were between three-quarters load and the full normal capacity. For alcohol fuels the points were at the normal load or at the point where the maximum power is developed. In general, the consumption of fuel in pounds per brake horsepower hour was greater as the load decreased from the normal rating. A difference of consumption was noted between a new and an old engine of the same type. The difference in consumption between the new and the old 15 to 30 McCormick-Deering tractor varied from about 17 per cent at half load to 28 per cent at full load. The Cletrac tractor was the only tractor where the equivalent amount of alcohol, in terms of gasoline, decreased as the load increased. The maximum power that could be developed using alcohol was materially higher than that which could be developed using either gasoline or kerosene, and the relative brake thermal efficiencies also were generally higher.

Fuel consumption could be increased by improper fuel needle valve setting, and the possibility of this was greater with alcohol than with the other fuels. Operation with alcohol fuel in these types of engines was characterized by smooth running, steady pull, and absence of overheating, preignition, knocking, or violent hammering. No sign of corrosion was noted.

Ample provision should be made to atomize, distribute uniformly, and vaporize the incoming fresh charge of alcohol. External heating of alcohol alone before it is mixed with air may prove beneficial. Overheating of the fresh mixture in the induction pipe may result in a decrease of volumetric efficiency.

**Effect of variable compression ratio on the performance of tractor engine using alcohol,** A. L. Teodoro (*Univ. Philippines, Nat. and Appl. Sci. Bul., 1 (1931), No. 3, pp. 187–221, figs. 12*).—Studies conducted at Cornell University on the effect of compression ratio on the suitability of alcohol as a fuel for a 10–20-h. p. tractor engine are reported. Straight alcohol of different strengths, denatured alcohol, gasoline, and kerosene were used in the studies. The compression ratios tested were 4.28 : 1, 5.03 : 1, and 6.43 : 1. A hydraulic dynamometer was used which was capable of absorbing a maximum of 150 h. p. at from 1,200 to 4,000 r. p. m.

Sixty-seven tests, each of at least 30 minutes' duration, showed that the engine could be run on alcohol at loads varying from a little over 1 h. p. to a little more than 25 h. p. The only change necessary to permit running the engine on alcohol was an enlargement of the fuel passage to supply a sufficient quantity of fuel. Without changing the size of the carburetor jet provided for the use of kerosene, the maximum power developed using alcohol was less than the rated capacity.

Tests were conducted with the area of the fuel passages about one and a half times as great as the area provided for kerosene. Under this condition, a maximum load of only a little over 50 per cent of the normal rating was attainable and the air choke had to be closed almost one-half. When two holes were used, having a total area of more than twice the area provided for kerosene, a load higher than the normal rated capacity was developed with the choke wide open.

With the carburetor adjusted to supply enough fuel to make the engine carry an overload of 10 per cent of the normal rating, the load could be quickly varied. Only the noise of the motor exhaust markedly showed that something had been changed. In general, except where the mixture was too lean, the engine operated more smoothly and ran with a lower radiator temperature when using alcohol than when using either kerosene or gasoline at any load. This was observed especially at points starting from three-quarters load to normal.

With alcohol, gasoline, and kerosene, the fuel consumption per brake horsepower hour for a given compression ratio depended not only upon the per cent load but also upon the setting of the fuel needle valve. The most economical points for both gasoline and kerosene appeared to be between three-quarters load and the normal load, at a compression ratio of 4.28. In the case of alcohol, however, the point of greatest economy was either at full load or at the point where the engine developed the maximum power. At three-quarters load approximately 15 per cent more fuel than the requirement for the normal load was consumed by the engine when alcohol fuel was used, at half load 150 per cent more. In the case of kerosene and gasoline, however, the percentages of fuel used in terms of the normal requirement were from 110 to 120 at half load and about 200 at quarter load. With a compression ratio of 4.28, the equivalent amount of alcohol fuel used in terms of gasoline was about 1.32 at normal load. The tests showed that, in general, the maximum power that the engine developed was usually higher using alcohol fuel than when using either gasoline or kerosene.

The most marked effect found with a change in the compression was in the fuel consumption and in the maximum power developed. The higher the compression ratio, the less was the consumption per brake horsepower hour and the greater was the thermal efficiency at all loads with all the alcohol fuels. The most economical consumptions using alcohol were 1.10 lbs. per brake horsepower hour at compression ratio 4.28, 1.06 lbs. per brake horsepower hour at compression ratio 5.03, and 0.91 lb. per brake horsepower hour at compression ratio 6.43.

The maximum power that was developed by the engine increased as the compression ratio was increased. No satisfactory tests could be run with kerosene at a compression ratio of 5.03. There seemed to be no appreciable effect on the consumption of fuel per brake horsepower when the compression ratio was changed from 4.28 to 5.03, using gasoline. However, in this case, the maximum power delivered seemed to increase slightly.

Except for some slight hammering of the engine. when a very lean mixture was used, the higher the compression ratio, the smoother and the quieter the engine ran using alcohol. No evidence of overheating, preignition, knocking, or corrosion was observed with changes of compression ratio.

In general, the lower the percentage of water in alcohol fuels, the less was the consumption per brake horsepower hour. The engine was more noiseless as the percentage of alcohol present in the fuel was greater. Due to the presence of water in the fuel, greater efficiency was developed near or beyond the normal load than at any other point below it.

With undiluted denatured alcohol and ethyl alcohol, starting at an engine temperature of below 70° F. was almost impossible for a compression ratio of 4.28. At a compression ratio of 5.03, the engine started at 70° but responded more quickly at about 75°. Easy starting was made on 94.3 per cent ethyl alcohol at a temperature below 60° when the compression ratio was 6.43.

The author believes that from the showing of the tractor during the tests made on gasoline and on kerosene, some provisions should be made to inject water into the cylinder with the fuel for loads varying from three-quarters to normal. The high temperature of the induction pipe diminished the volumetric efficiency at these loads. In the case of alcohol, however, better results were obtained at these loads. The latent heat of vaporization of the fuel was high, so that the high temperature of the intake manifold was not an objection but rather an advantage.

**Farm power in the Yazoo-Mississippi Delta,** L. E. Long (*Mississippi Sta. Bul. 295 (1931), pp. 30, figs. 10*).—This bulletin reports the results of a study conducted in cooperation with the U. S. D. A. Bureaus of Agricultural Economics, Animal Industry, and Agricultural Engineering as a part of an undertaking of broader scope covering five Southern States. It involves a survey of 94 plantations in the region, 66 of which used tractors and mules, and 28 used mules only.

While no general conclusions are drawn, a comparison of tractor and mule power for farm operations in the region shows the economy of tractors for those operations which utilized most of the available power, such as flat breaking and disking. On the other hand, the difference in cost of harrowing with a tractor and 10-ft. harrow and with 2 mules and a 7- or 8-ft. harrow is in favor of the mules because the tractor was used at approximately half of its maximum efficiency. Also the cost per acre of harrowing with 3 mules was greater than that with 2 mules, probably because the 3-mule teams could have drawn a larger implement.

It also was found that the quality of work in bedding may vary widely even with middle bursters of the same size, since depth of bursting is an important factor.

The costs of cultivating per acre varied upward from the tractor to the 1-mule team. A comparison of trucks and mules for road hauling showed the ton-mile cost of road hauling with trucks to be much less than that with mules.

**The combine harvester-thrasher,** H. J. Hopfen (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Sci. and Pract. [Rome], 22 (1931), No. 9, pp. 344–353*).—A brief critical summary is given of experience with the combine in different agricultural regions of the world. It is pointed out that its use is more advantageous in arid regions than in humid regions and favors collective farming. A bibliography of 40 references is included.

**The combine harvester in western Canada,** E. A. Hardy (*Sci. Agr., 12 (1931), No. 3, pp. 121–129, figs. 5*).—In a contribution from the University of Saskatchewan, an account is given of experience in the use of the combine and related machinery in western Canada.

**Charts show fundamentals of the drying process,** M. Tomlinson (*Heating, Piping and Air Conditioning, 3 (1931), No. 12, pp. 1017–1020, figs. 8*).—Graphic data are presented showing the effect of a change in any one of the factors which influence the drying process. Control instruments also are discussed. These data are generally applicable among other things to the artificial dehydration of agricultural products, and may be used to develop methods for the solution of specific drying problems.

**Roof exposure tests of outside white pine** (*U. S. Dept. Com., Bur. Standards Tech. News Bul. 156 (1930), p. 33*).—It is reported that during the past six years a large number of laboratory-made white paints have been subjected to weathering tests. The paints have been applied either in three coats on carefully selected wood panels or in two coats on thoroughly cleaned metal panels.

The results observed indicate that pure white lead paints are satisfactorily durable. Lead-zinc paints, with zinc oxide contents not exceeding 30 per cent, are also satisfactory. An increase of the zinc oxide content to 50 per cent, however, results in cracking and scaling in paints on wood panels. On metal, lead-zinc paints (zinc oxide content not exceeding 30 per cent) are better rust preventives than are pure white lead paints. Titanium-zinc paints, provided that the zinc oxide content does not exceed 30 per cent, are weather resistant and remain clean and white longer than do lead-zinc or white lead coatings.

After three years' exposure titanium-zinc paints, some containing a mixture of titanox, zinc oxide, and white lead, are giving good results. Among the best of these is a mixture of titanox 45 per cent, zinc oxide 20 per cent, and white lead 35 per cent, this coating being free from cracks and having worn, by slight chalking, to a smooth, clean surface. Increase in the zinc oxide content while retaining the ratio of the other constituents, results in cracking. Pure titanium oxide, calcium titanox, and barium titanox paints chalk excessively.

The vehicle used in these paints consisted of 60 parts raw linseed oil, 20 parts heavy-bodied linseed oil, and 20 parts turpentine and drier.

## AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

**[Investigations in agricultural economics at the Alabama Station, 1930–31]** (*Alabama Sta. Rpt. 1931, pp. 8–10, 55*).—An economic study of poultry and cotton farming in Marshall and DeKalb Counties, 1927–1929, based on farm business records from 88 cotton farms having commercial poultry flocks and 236 cotton farms with small farm flocks, is reported on by C. G. Garman. Farmers with commercial flocks received an average return of 43 cts. per hour for time spent on their laying flocks. Flocks of less than 100 layers averaged 28 cts. per hour, and those of 200 or more layers 53 cts. Flocks with an annual production between 70 and 129 eggs per layer averaged 18 cts., as compared with 76 cts. for those with a production of 160 or more eggs per layer. Farmers with commercial flocks had an average labor income of $313 and those with small farm flocks $253. Yield of cotton per acre was the factor most closely associated with labor income, the farms having yields of less than 300 lbs. of lint per acre having an average labor income of $58, as compared with $653 for those having yields of 400 lbs. or more of lint per acre. Cotton fields on which less than 450 lbs. of fertilizer were applied per acre averaged 291 lbs. of lint per acre, and those on which 600 lbs. or more of fertilizer were applied, 395 lbs.

A study of farm organization on the heavy clay soils of the Black Belt of the State is reported on by J. D. Pope and C. M. Clark. A table is included showing the average acreage, color of operator, and average labor income of the farms grouped by type of farming. The utilization of lands, acreage in different crops, tenancy and labor income of different tenure groups, and the returns to landlords on investment are discussed. The average net cost of producing cotton was 12.2 cts. per pound of lint, and the average profit was 4.8 cts. per pound. The cost of production increased from $13.04 per acre for fields producing 50 lbs. or less of lint per acre to $17.31 per acre with yields of 200 lbs. or more of lint. The average return per hour of labor increased from —1 ct. to 30 cts.

A study of the organization of farms in the peanut area by Pope showed that in 1927 and 1928 the average farm incomes increased as the size of farms increased. Converted to equivalent solid acres, the yield of corn was higher for the acreage interplanted with peanuts than for the acreage planted to corn alone. There was little difference in the average yield of peanuts. Average yields of corn per acre were more than 5 bu. greater on farms using 250 lbs. or more of fertilizer per acre than on those using 49 lbs. or less.

A study of J. F. Duggar of 22 fields cropped chiefly with sorghum showed that the costs of producing and storing silage were $26.92 per acre and $4.13 per ton.

**Agricultural regions of North America.—Part X, The grazing and irrigated crops region,** O. E. Baker (*Econ. Geogr., 7 (1931), No. 4, pp. 325-364, figs. 26*).—This is the tenth article of the series previously noted (E. S. R., 66, p. 382).

**Successful farm practices in the Upper Peninsula,** G. W. Putnam (*Michigan Sta. Spec. Bul. 215 (1931), pp. 69, pl. 1, figs. 54*).—The climate and soils of the Upper Peninsula of Michigan and the farm practices that have proved successful in that section in raising pasture grasses, hay and silage crops, small grains, potatoes, and root crops and in dairying and livestock and poultry production are described. Lists are given of the varieties of fruits and vegetables best adapted to the area. The observations of the author are based on 14 years' experience in the area and a decade of contact with crops and livestock experiments at the Upper Peninsula Substation.

**Florida truck crop competition.—II, Intra-State,** J. L. Wann (*Florida Sta. Bul. 238 (1931), pp. 86, figs. 20*).—This is a continuation of the study previously noted (E. S. R., 65, p. 886), and was made to determine how the trucking areas of the State compete among themselves, the keenness of this competition, and the production areas for each crop. The data used are for the year ended August 31, 1929, and were obtained from original conductors' waybills for rail shipments, express waybills at 306 shipping points, and ship companies' records for boat shipments at Jacksonville, Miami, and Tampa. The data for each of the major crops, watermelons, celery, tomatoes, green beans, early potatoes, cabbage, cucumbers, peppers, and strawberries, and for the submajor crops, lettuce, escarole, eggplants, romaine, green corn, squashes, okra, and green peas, are presented in the text, tables showing weekly summaries of equivalent car-lot shipments, by areas, for the year, and maps showing the equivalent car-lot shipments, by counties and areas. For the minor and miscellaneous crops, tables with explanatory text are given showing the weekly summary of equivalent car-lot shipments of each commodity for the year.

In determining the production areas for the different crops the time of shipments, geographic location, methods of production as influenced by soil, topography, drainage, land values, etc., and the advice of growers, shippers, and others interested in the industry were considered.

**A study of taxation in Minnesota with particular reference to assessments of farm lands,** G. B. Clarke and O. B. Jesness (*Minnesota Sta. Bul. 277 (1931), pp. 42, figs. 3*).—The sources of revenue, method of assessment, and method of equalization under the tax system of the State are described. Using 3,655 sales of unplatted (farm) property recorded by the Minnesota Tax Commission during the period 1924–1927, analysis is made of the relation between assessed and sale value of farms in each of the 6 districts into which the State was divided because of the wide differences in land values. Further analysis was made in each district for the period 1924–1927 and in 2 districts for the period 1914–1915 of the average ratios of assessed value to sale value with farms grouped according to acreage and value per acre. Similar analyses were made for platted (village, town, and city) property, using 1,662 sales during 1926 and 1927. Maps and tables are given showing, by counties, the taxes per $1,000 taxable value, the percentages of 1927 taxes uncollected January 1, 1929, and the amounts and percentages of 1929 taxes uncollected in January, 1931. Some methods of remedying the delinquency situation are discussed, and some suggestions are made for improving the tax system.

The general property tax furnishes nearly 80 per cent (76 per cent in 1930) of the total revenue of the State and 96.3 per cent of the local revenue. In 1930 the general property tax was distributed as follows: Cities and villages, education 35.7 per cent, road and bridge 6.6, county (except road and bridge) 10.2, local 40.1, and State 7.4 per cent; and townships, education 34.2 per cent, road and bridge 32.4, county (except road and bridge) 15.9, local 5.4, and State 12.1 per cent. The average ratios and ranges of ratios of assessed to sale values for the farm lands were for district 1, 92.3 per cent and from 25 to 205 per cent; district 2, 89.1 and 25 to 195; district 3, 90.3 and 35 to 195; district 4, 86.6 and 15 to 205; district 5, 89.7 and 15 to 195; and district 6, 84.1 and 15 to 205. The differences between the average assessment of the highest and lowest value groups in the several districts were (1) 24.6, (2) 28, (3) 33.1, (4) 26.5, (5) 30.8, and (6) 51.6 per cent.

Except for the tendency of the farms of less than 40 acres to have the lowest assessment percentages, there was no apparent bias in the percentage of their sale value at which different farms were assessed. Grouped on a basis of value per acre, the differences between average assessment percentages for the highest and lowest value groups of farms were for district 1, 43.8; 2, 62.8; 3, 62.2; 4, 45.2; 5, 40.6; and 6, 79.3. The conditions in 1914–1915 in the 2 districts studied were substantially the same as in 1924–1927.

The study of platted properties showed that assessments of real estate in cities and villages are as much biased in favor of high value properties as are those in the rural districts and that there is fully as much inaccuracy. The percentage of 1929 taxes uncollected in January, 1931, were 5.52, 4.03, 8.35, 13.16, 22.26, and 9.64, respectively, in the 6 districts, being over 25 per cent in 13 counties and 66.14 in 1 county.

**An analysis of Mississippi River traffic, 1918–1930, II,** J. D. SUMNER (*Jour. Land and Pub. Util. Econ., 8 (1932), No. 1, pp. 11–23, figs. 3*).—This is a continuation of the article previously noted (E. S. R., 66, p. 585). It discusses the commodity charactertistics of the Federal barge line traffic, and makes comparisons of the kinds of freight handled by the railroads and barge line.

**Trucking livestock to South St. Paul,** E. C. and E. A. JOHNSON (*Minnesota Sta. Bul. 278 (1931), pp. 31, figs. 11*).—This analysis is based upon records of the Union Stock Yards Company and livestock commission agencies in South St. Paul and information obtained from railroads and truck operators. Tables and charts are included and discussed, as are also truck rates, comparative costs of shipping by truck and rail, the convenience of marketing by truck, and the effect of trucking on cooperative associations.

The percentages of livestock arriving by truck increased from 1.8 in 1920 to 20.6 in 1930 for cattle, from 2.5 to 45.5 for calves, from 1.6 to 26.6 for hogs, and from 0.4 to 12 for sheep. In 1929, 94 per cent of all truck loads came from within a 75-mile radius and 67 per cent from within a 45-mile radius. From 1924 to 1929 the average haul for cattle increased from approximately 22 to 47 miles, that for calves from 24 to 47 miles, that for hogs from 25 to 46 miles, and that for sheep from 44 to 55 miles.

The losses by truck per 1,000 head due to death and to crippled animals in 1929 were for cattle 0.3 and 2.39, calves 0.65 and 0.41, hogs 0.62 and 1.49, and sheep 0.81 and 0.34, respectively. By rail the losses were for cattle 0.29 and 0.77, calves 3.29 and 0.98, hogs 1.66 and 2.9, and sheep 1.75 and 0.78, respectively. The losses by truck and by rail, however, are not directly comparable, as most of the rail hauls were longer both in distance and in time.

Comparisons of the costs of marketing by truck and rail with a 40-mile haul showed that rail shipments cost 4.1 cts. per 100 lbs. less for hogs and 2.7 cts. less per 100 lbs. for cattle, no allowance being made for shrinkage. The rate structure in the case of trucks was found to be very unstable. Livestock trucking has also been responsible for many cooperative shipping associations in the area ceasing to operate.

**The supply side of the New York milk market,** H. A. ROSS (*New York Cornell Sta. Bul. 527 (1931), pp. 151, figs. 41*).—This study was made in cooperation with the New York Central Railroad with a view to analyzing the present supply of the New York milk market and determining the most economical means of meeting future requirements of that market. Records of 1,054 plants receiving milk from 66,870 farms were studied. Of the plants, 122 handled New York approved grade A milk, 603 New York approved grade B milk, 45 New York unapproved milk, 55 milk manufactured in plants located on railroads, and 229 milk manufactured in plants located off of railroads. Records were available on all the plants for 1927, and on practically all of them for the 3-year period 1925–1927. Most of the tables and charts are for the year 1927. The principal data used as a basis for the study were (1) the total pounds of milk delivered monthly at each milk-receiving station or factory, (2) the number of farms from which milk was received, and (3) the percentage of fat in the milk. In addition, dairy-survey records on several thousand individual farms were available for more detailed study.

Detailed analysis is made of the quantity of milk received per plant, seasonal production, seasonal surplus, geographical production, production by freight zones, and production along various railroads. Using the 1927 data and also data from 15,217 approved grade A and grade B farms for the period 1922–1928, analysis is made of the seasonal variations in the fat content of milk sold to the different types of plants and of that produced by summer, winter, and intermediate dairies. Using data for the years 1922–1930 from 250 milk plants receiving deliveries from approximately 15,000 farms and data for 1908–1930 from 45 plants receiving approved grades A and B milk, the trends in production, both total and seasonal, are analyzed. Using data gathered in surveys by inspectors and veterinarians covering 2,535 grade A and 1,817 grade B milk farms, the factors relating to the production of milk in 1927 are analyzed.

Some of the findings of the study follow: Many of the country plants receive too small a quantity of milk for economical operation. Additional quantities may be obtained by closing unessential plants, by increasing the number of farms producing approved milk, and by increasing the average production per farm. The rapid expansion of the New York milk shed into manufactured milk territory during the past few years has resulted in a wide range in seasonal production which is poorly adapted to the seasonal demand of the fluid milk market. A slow shift in seasonal production would greatly increase the November supply and decrease the amount of milk that must now be manufactured. The center of production of approved milk is now about 60 miles beyond the 201–210 mile zone, on which prices are usually based, and will probably move still farther from New York. A wide range in the average fat content of milk in various parts of the milk shed exists, largely because of the varying proportions of the different breeds of cows and of the earlier methods of paying for milk on different tests. Seasonal differences in the fat content are due largely to the seasonal freshening of cows. The downward trend in the test of milk appears to have been checked, but if an increase in fat content is desired some greater financial incentive than now obtains appears necessary. Production of milk per farm has tended upward for some years, but with numerous fluctuations due chiefly to prices received. The trend toward more winter production has been as rapid in summer-dairying regions as in winter-dairying regions, provided both regions received the same prices for milk. From a strictly market standpoint, earlier freshening of fall-freshening cows and later freshening of spring-freshening cows would be desirable.

The author in concluding states that "the problem of supplying the increasing demand for milk in New York has been met during the past few years by the conversion to fluid use of milk previously manufactured in plants or on farms, by stimulation of production, and by a shift in seasonal production. Since the first two methods increase surplus during the greater part of the year, the best solution of the problem appears to be a gradual shift in seasonal freshening so that production will more nearly conform to seasonal demand. If this change is brought about properly, the present approved-milk shed is capable of supplying the New York market for many years to come."

**The consumption of milk and dairy products in metropolitan Boston in December, 1930,** F. V. Waugh (*1931, pp. 27*).—This report, published by the Massachusetts and New Hampshire Experiment Stations and the Massachusetts Department of Agriculture, cooperating with the New England Dairy and Food Council, the New England Research Council on Marketing and Food Supply, and the U. S. D. A. Bureau of Agricultural Economics, is based on a study of the records of monthly retail sales of milk, 1929 and 1930, of 6 milk routes representative of high, medium, and low income districts of metropolitan Boston, and on a house-to-house survey made during the first two weeks of December, 1930, of 2,879 families in metropolitan Boston.

The data are analyzed to show the effects of nationality, income, number of persons in family, and age of children upon the consumption of milk, grades of milk used, and the drinking of milk; of nationality and income on the consumption of cream; and of nationality on the consumption of other dairy products and butter substitutes. Other tables show the reasons given for using grade A milk and condensed milk and for drinking or not drinking milk, the acquaintance of families with milk advertisements and the milk programs in schools. the sources of milk purchases, and the average weekly purchases and daily per capita purchases from different sources of supply by different nationalities.

**Marketing Michigan beans**, W. O. HEDRICK (*Michigan Sta. Spec. Bul. 217* (*1931*), *pp. 85, figs. 12*).—"This study tries to sketch the picture of the whole length of the bean marketing route from the farmer to the final consumer." The data were gathered through interviews with middlemen and manufacturers. The sections pertaining to elevators are based on data from a sample consisting of 19 independent, 19 farmers' cooperative, and 9 line elevators selected at random, but representative of all parts of the bean belt of the State. The organization, equipment, and operation of elevators, and the assembling, docking, storing, processing, grading, inspection, etc., of beans by the elevators are discussed. Analysis is made of the different items entering into elevator handling costs for beans in 1928–29. The services of jobbers are described, and their sales practices and handling costs are discussed. Some analysis is made of jobbers' prices, the trends in price, the spreads in prices, etc. Transportation costs on beans, the cannery outlet for Michigan beans, the marketing outlets for dry beans, and consumer demand for beans are described and discussed.

The defects and weaknesses of the present bean marketing system are pointed out, and recommendations are made as to some steps in improving the present situation.

**Crops and Markets, [January–February, 1932]** (*U. S. Dept. Agr., Crops and Markets, 9* (*1932*), *Nos. 1, pp. 40, figs. 3; 2, pp. 41–88, figs. 3*).—Included are reports, summaries, tables, charts, and notes of the usual forms. No. 2 also includes tables showing, by States, the number and value on farms. January 1, 1920–1932. of different kinds of livestock, and the average monthly farm prices since 1910 of different kinds of animals, poultry, and their products.

**International yearbook of agricultural statistics, 1930–31** (*Internatl. Inst. Agr.* [*Rome*], *Internatl. Yearbook Agr. Statis., 1930–31, pp. XXXIX+828*).—This is a continuation of the series previously noted (E. S. R., 64, p. 690). Tables have been added concerning stocks of cereals and index numbers of agricultural products in different countries. The tables are in English and French.

**American cooperation** (*Washington, D. C.: Amer. Inst. Coop., 1931, vols. 1, pp. XI+510, figs. 9; 2, pp. IV+516, figs. 15*).—Included are the addresses and informal discussions presented at the seventh summer session of the American Institute of Cooperation, held at Manhattan, Kans.. June 1–27, 1931. Volume 1 includes, among others, the following:

*National problems of the cooperative movement.*—Developments in Cooperation Prior to Passing of Agricultural Marketing Act, by B. H. Hibbard (pp. 12–17); The Development of Cooperation in America Since the Establishment of the Federal Farm Board, by R. Hood (pp. 18–27); National Organization of Agriculture, by A. M. Hyde (pp. 28–35); Some Accomplishments of the Federal Farm Board, by J. C. Stone (pp. 35–51); Cooperation—The Road to Success, by A. Capper (pp. 52–55); A Plan to Control Agricultural Production, by V. Christgau (pp. 55–60); Agriculture's Marketing Program, by L. J. Taber (pp. 61–65); Financial Structure of Cooperatives, by S. Reed (pp. 65–85); and Production Credit as Related to Cooperative Marketing, by E. Englund (pp. 85–97).

*Educational relationships.*—What the Smith-Hughes System May Do, by C. H. Lane (pp. 101–103); Relations of Cooperatives and Smith-Hughes Workers, by J. H. Pearson (pp. 104–108); Teaching Cooperation in South Dakota, by W. P. Beard (pp. 109–120): Cooperation between Schools and Marketing Organizations, by R. Fife (pp. 120–125); Need for Cooperative Education, by E. A. O'Neal (pp. 125–138); and The Extension Service and Cooperation, by J. A. Evans (pp. 139–153).

*Cooperative publicity.*—Publicity for Cooperative Associations, by F. B. Nichols (pp. 157–159): Source Materials for Copy in Cooperative Papers, by J. D. Harper (pp. 160–163); Problems of Editing Copy, by J. W. Cummins (pp. 164–166); Financing the Cooperative Paper Exclusively through the Cooperative's Treasury, by K. Hinshaw (pp. 167–172); Financing the Cooperative Paper Largely through Advertising, by G. B. Latham (pp. 173–176); Extending Circulation beyond the Cooperative's Membership, by V. C. Sherman (pp. 177–180); Some Problems Involved in the Use of Second Class Mailing Privileges, by B. McDaniel (pp. 180–190): Relations between Cooperative Papers and Farm Papers, by T. C. Richardson (pp. 190, 191); What the Member Wants in the Cooperative Paper, by R. D. Tomlinson (pp. 192, 193); Publicity Plans of Cotton Cooperatives, by J. H. Caulfield (pp. 194–196); Cooperative Papers as Viewed by an Outsider, by R. I. Thackrey (pp. 196–198); and Problems Involved in Using the Radio, by L. L. Longsdorf (pp. 199, 200).

*Cotton, citrus fruit, and grapes.*—The Federal Farm Board: Operating in Cotton, by R. H. Montgomery (pp. 203–211); Adjusting the Supply of American Cotton to World Demand, by C. O. Moser (pp. 212–219); Lessons from the Merchandising of Citrus Fruit, by P. S. Armstrong (pp. 219–228); and The California Grape Control Plan, by S. W. Shear (pp. 229–248).

*Marketing dairy products.*—The Progress of Cooperation Among Dairy Farmers, by C. W. Holman (pp. 251–263); Possibilities of Adjusting Dairy Production to Demand, by H. A. Ross (pp. 263–278); A Program for a Milk Shed, by D. N. Geyer (pp. 279–287); and by J. H. Mason (pp. 287–293); Marketing Problems of Producers Supplying Condenseries, by R. A. Peterson (pp. 293–305); Price Policies during Years of Depression, by W. H. Bronson (pp. 306–317): Price Policies in the Depression, by H. E. Denlinger (pp. 218–329); Price Policies of Milk Associations, by I. W. Heaps (pp. 329–335); Coordination of the Marketing of Butter and Other Processed Dairy Products, by T. G. Stitts (pp. 335–341); Selling Dairy Products to Chain Stores, by A. J. McGuire (pp. 342–346); Differences in Marketing Products in an Intensive Dairy Section and in a General Farming Region, by A. W. Seamans (pp. 346–353); Collective Bargaining of Butterfat, by F. A. Gougler (pp. 353–362); When, Where, and How to Start a Cooperative Creamery, by P. L. Betts (pp. 363–365); When, Where, and How to Start a Cooperative Creamery, by A. J. McGuire (pp. 366–371); Improving the Quality of Creamery Products in the Northwest, by J. R. Brown (pp. 372–377); When, Where, and How to Organize a Fluid Milk Marketing Association, by A. D. Lynch (pp. 377–384); and Improving the Quality of Creamery Products, by O. Hanson (pp. 385–391).

*Cooperative marketing of eggs and poultry.*—The Merchandising of Eggs and Poultry, by S. D. Sanders (pp. 395–403); Factors Determining Success in Marketing Midwest Poultry and Eggs, by F. G. Peters (pp. 403–407); Problems of Membership Relations, by C. C. Edmonds (pp. 407–416); A Poultry Marketing Program for the Midwest, by A. Willardson (pp. 416–434); How the Cooperative Can Assist in the Consumption of Eggs, by R. V. Hicks (pp. 434, 435); and Factors Involved in Improving the Efficiency of Cooperative Marketing of Poultry and Eggs, by E. W. Benjamin (pp. 436–445).

*Cooperative potato marketing.*—Experience of the Kaw Valley Potato Marketing Association, by J. Haney (pp. 449–460); Experience of the Colorado Potato Growers Exchange, by W. F. Heppe (pp. 461–475); New Merchandising Problems of Potatoes, by H. L. Robinson (pp. 476–481); and Intersectional Cooperation and Production Control, by P. R. Taylor (pp. 481–493).

Volume 2 includes the following:

*Cooperative livestock marketing.*—Possibilities of Adjusting Livestock Production to Demand, by C. B. Denman (pp. 3–12); An Evaluation of the Livestock Marketing Work of the Federal Farm Board, by E. G. Nourse (pp. 12–18); Can the Flow of Livestock to Market Be Stabilized? by C. G. Randell (pp. 18–28); The Effect of Trucking on Local and Terminal Livestock Marketing, by H. H. Hulbert (pp. 29–46); Possibilities of Controlling Trucking Through Local Associations, by A. E. Kies (pp. 46–54); Possibilities of Controlling Livestock Trucking Through Regional or Terminal Associations, by S. Meiks (pp. 54–64); Cooperative Concentration Plants, Their Advantages and Limitations, by E. Elijah (pp. 65–74); How the Livestock Cooperative or Terminal Market Is to Coordinate with Concentration Point Development, by S. R. Guard (pp. 75–91); Relation of Direct Marketing to the Determination of Prices, by P. L. Miller (pp. 92–115); Problems of a National Livestock Marketing Association, by P. O. Wilson (pp. 116–129); Financing Livestock Feeder Operations, by C. A. Stewart (pp. 129–134); and New Methods of Merchandising Meat Products, by F. M. Simpson (pp. 134–139).

*Problems of grain cooperatives.*—An Evaluation of the Grain Program of the Federal Farm Board, by O. B. Jesness (pp. 143–159); Possibilities of Adjusting Wheat Production to Demand, by E. J. Bell, Jr. (pp. 160–172); Functions of Local Elevators in Storing Grain—Wheat, by L. E. Webb (pp. 172–180); Handling Food Grains in the Local Elevator, by F. Robotka (pp. 180–208); Cash Sale Through the Cooperative, by H. E. Witham (pp. 208–214); Storage for Deferred Sale by Members, by W. J. Kuhrt (pp. 215–220); Seasonal Pooling, by E. R. Downie (pp. 221–228); Operations of Cooperative Line Elevators, by J. Manley (pp. 228–241); Relations with Members, by W. L. Stahl (pp. 241–251); Legal Phases of the Grain Cooperatives, by S. Reed (pp. 251–254); and Operating Problems in a National Cooperative Grain Marketing Organization, by G. S. Milnor (pp. 254–262).

*Problems of cooperative wool marketing.*—An Evaluation of the Cooperative Wool Program, by M. R. Benedict (pp. 265–286); The Set-Up of the National Wool Marketing Corporation, by J. B. Wilson (pp. 286–297); Policies in Making Payments to Members, by J. H. Lemmon (pp. 298–301); Selling Wool Through a National Organization, by M. Staff (pp. 302–309); and Relations of Regional Wool Marketing Organizations to Members, by W. M. Ross (pp. 309–313); and by L. B. Palmer (pp. 314–316).

*Cooperative purchasing.*—Accomplishments in Cooperatively Supplying Oil and Gas, by I. H. Hull (pp. 319–324); A Cooperative Buying Service for Local Oil Associations, by H. A. Cowden (pp. 325–338); Cooperative Purchasing and Mixing of Feeds, by S. D. Sanders (pp. 339–347); and by Q. Reynolds (pp. 347–359); Credit Problems Resulting from the Handling of Sidelines in Local Cooperatives, by G. E. Metzger (pp. 360–373); and Handling Sidelines by Local Units of Central Cooperatives, by A. H. Lauterbach (pp. 373–379).

*Mutual Insurance.*—The Insurance Needs of Agriculture, by V. N. Valgren (pp. 383–396); and by H. G. Keeney (pp. 397–402); Nature and Extent of Mutual Insurance, by H. P. Cooper (pp. 403–416); Meeting the Cooperative Needs for Insurance, by J. J. Fitzgerald (pp. 417–424); Mutual Property Insurance, by O. E. Hurst (pp. 425–437); Mutual Casualty Insurance, by

J. M. Eaton (pp. 438–454); and Prevention of Losses, by M. P. Luthy (pp. 454–465).

**The social and economic areas of Yates County, New York, H. F. Dorn** (*New York Cornell Sta. Bul. 529* (*1931*). *pp. 52, figs. 10*).—This study is one of a series undertaken to discover the factors determining the structure and the area of communities and the influence of large villages on small villages and of cities on villages. Data were gathered during the summer of 1929 regarding churches, business firms, professional people and tradespeople, organizations, types of communication, and institutions in Yates County. The agriculture, communication and transportation facilities, and population of the county are described. The village service areas of different economic and social agencies are shown graphically and discussed. Tables are included and discussed showing the changes in the number and kinds of business and manufacturing firms. 1900, 1915, and 1929, and professional people and tradespeople, and types of communication and institutions, 1929, and the number of each by kinds or types in villages of different classes according to population. Analysis is made for 1929 of the number and kinds of organizations and institutions, membership, program of work, etc. The possibilities of larger community areas in the county are discussed.

## FOODS—HUMAN NUTRITION

**Use of corn and corn products in the home** (*U. S. Dept. Agr., Bur. Home Econ.*, [*1931*], *pp.* [*1*]+*9*).—This is a mimeographed classified list of annotated references to the literature on the preparation and uses of corn oil, sugar, and sirup; the canning and drying of sweet corn; recipes for corn and corn products; and miscellaneous studies on the composition and nutritive value of corn.

**New uses for the sweet potato: Sweet potato jelly, G. A. Shuey** (*Tennessee Sta. Circ. 43* (*1932*), *pp. 2*).—Directions are given for the use of cull sweetpotatoes in making a jelly which is said to be excellent. The juice is prepared by boiling the washed but unpeeled potatoes with an equal weight of water until soft, mashing them in the cooking water while still hot, and filtering through a double thickness of cheesecloth, squeezing out as much liquid as possible. In making the jelly, 4 measuring cupfuls of the juice are used with 6½ cupfuls of sugar, the juice of an average sized lemon, and 1 cupful of commercial pectin. The juice and sugar are boiled for 7 minutes (or until the temperature of the liquid reaches 218° F.), with frequent stirring, the lemon juice and pectin are added, and the boiling is continued for another 8 minutes or until the liquid again reaches 218°. After removal from the heat the juice is allowed to stand for 1 minute and is then skimmed, poured into jelly glasses, and sealed with paraffin in the usual way.

**Tropical and oriental vegetables, fruits, and nuts: Proximate composition, G. Adams and C. Chatfield** (*U. S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 7* (*1931*), *pp.* [*1*]+*11*).—This is a mimeographed collection of 64 annotated references on the proximate composition and in some instances the calcium, phosphorus, and iron content of oriental vegetables. fruits, and nuts.

**General properties of some tropical and sub-tropical fruits of Florida, O. D. Abbott** (*Florida Sta. Bul. 237* (*1931*), *pp. 32, figs. 5*).—Tropical and subtropical fruits grown more or less extensively in Florida are discussed from the standpoint of composition, general characteristics, and food value, the fruits being classified as flavor fruits including guava, mango, loquat, orange, and pineapple and food fruits including avocado, fig, banana, and persimmon. The data on composition have been compiled from many sources, using as far as possible analyses of fruits grown in Florida. Hitherto unpublished data include analyses by R. W. Ruprecht of the ash of Florida-grown oranges, tangerines, and grapefruit and by A. L. Stahl of a number of varieties of Florida-grown avocado. The avocado analyses include average values for 50 samples of mature fruit of the Guatemalan race (*Persea americana*) of the Eagle Rock and Wagner varieties, 25 of the West Indian race (*P. americana*) of the Trapp and Waldin varieties, and 25 Collinson and 35 Lula varieties of hybrids *Persea* spp. The greatest variation in composition was in the fat content, which ranged from 7 per cent in the Waldin variety of the West Indian race to 23 per cent in the Wagner variety of the Guatemalan race. The range in other values was moisture from 68 to 83 per cent, sugar from 1.4 to 1.9, protein from 1.2 to 1.6, and ash from 1 to 1.8 per cent. The principal factors thought to influence the fat content are the variety, stage of maturity, and cultural conditions.

A considerable portion of the text is devoted to a discussion of the hygiene of fruit, with the conclusion that "in the main the value of fruit in the diet depends upon its bulk, upon the mineral salts, starches, glucosides, sugars, and other substances present, upon its refreshing, appetizing, and laxative qualities, and upon its vitamin content."

A list of 26 references to the literature is appended.

**The food value of oranges and grapefruit,** D. B. Jones (*U. S. Dept. Agr., Bur. Chem. and Soils, [1931], pp. [1]+12*).—A mimeographed summary of information, with 36 references to the literature.

**Honey cookery,** C. Leeby (*N. Dak. Agr. Col. Ext. Circ. 108 (1931), pp. 12, figs. 6*).—This is a collection of tested recipes for the use of honey in gingerbread, muffins, biscuits, cakes, cookies, custards and other desserts, candy, and jelly.

**Calcium and phosphorus content of Alabama vegetables,** E. R. Bishop (*Alabama Sta. Rpt. 1931, pp. 49, 50*).—In this study of the influence of variety, age, soil type, and fertilizer treatment on the calcium and phosphorus content of vegetable greens, wide variations were found in the content of each of the elements in different samples of a given vegetable. These variations have been found "(1) to be greater on the basis of dry weight than of edible portion, (2) to indicate a tendency toward an inverse calcium and phosphorus relationship, (3) to be slight with variety except that American varieties of turnip greens have a higher calcium content than Japanese varieties, (4) to be little influenced by age, (5) to be much affected by weather conditions, (6) to be influenced by the soil and fertilizer treatment. Turnip tops and tendergreen have a higher calcium and phosphorus content than Chinese cabbage."

**Distribution of manganese in foods,** W. H. Peterson and J. T. Skinner (*Jour. Nutrition, 4 (1931), No. 3, pp. 419–426*).—This paper, supplementing an earlier one by Lindow and Peterson (E. S. R., 58, p. 290), reports manganese analyses of 83 food materials. The method of preparing the samples was the same as in the previous study. The manganese was determined by the periodate method, using the technic of Davidson and Capen noted on page 806 for samples containing 0.1 mg. or more, and the authors' modification (E. S. R., 65., p. 12) for samples containing very small quantities of the element.

Arranged in descending order of manganese content, the 12 classes of foods represented in the foods analyzed were nuts; cereals and their products; dried legume seeds; green leafy vegetables; dried fruits; ,roots, tubers, and stalks; fresh fruits; nonleafy vegetables; animal tissue; poultry and poultry products; dairy products; and fish and sea foods.

From the standpoint of the quantities of these food groups entering into the ordinary diet, it is considered that cereals and their products contribute most to the supply of manganese, followed by fruits and vegetables. In regard to the requirement for manganese, the authors state that "only when the specific function or functions of manganese in the animal body have been uncovered and the amount needed daily for proper nutrition ascertained, can it be said that a given diet is adequate or deficient in this element. In view of the fairly high concentration of the element in cereals and their products as well as in fruits and vegetables, it appears unlikely that ill effects from inadequate amounts of manganese will result so long as these classes of food materials contribute their present share to the total food intake."

**The effect of diet on the manganese content of milk,** A. R. KEMMERER and W. R. TODD (*Jour. Biol. Chem., 94 (1931), No. 1, pp. 317–321*).—Following essentially the same method as in previous studies by Elvehjem, Herrin, and Hart on the effect of adding iron (E. S. R., 57, p. 92) and by Elvehjem, Steenbock, and Hart on the effect of adding copper (E. S. R., 62, p. 892) to the ration of dairy cattle upon the content of these elements in the milk, the authors have demonstrated that the manganese content of milk produced by cows on a normal ration was not increased when sufficient manganous sulfate was added to the ration to increase the manganese intake fivefold. The manganese content of goat's milk was increased very slightly by the addition of manganous sulfate in amounts sufficient to increase the manganese intake fivefold to tenfold.

The milk produced by cows on a normal ration contained approximately 0.03 mg. and goat's milk approximately 0.082 mg. per liter.

**Nutrition in health and disease for nurses,** L. F. COOPER, E. M. BARBER, and H. S. MITCHELL (*Philadelphia and London: J. B. Lippincott Co., 1930, 3. ed., rev., pp. VIII+574, figs. 103*).—This book is a revision of the volume noted previously (E. S. R., 60, p. 891).

**Basal metabolism standards: A statistical comparison of their prediction values,** R. L. JENKINS (*Jour. Nutrition, 4 (1931), No. 3, pp. 305–321, figs. 3*).—The principal conclusions drawn from this statistical comparison of the prediction values of various basal metabolism standards in use at the present time are essentially as follows:

For the clinical application of any basal metabolism standard there should be available the mean basal metabolism, determined under the same conditions, of 25 or more normal individuals of the same locality. The Dreyer standards, based upon observed weight, appear to have the greatest advantages and the least disadvantages, but in all border-line or doubtful cases the metabolic rate should be calculated by more than one standard, with due allowance for the differences in mean levels of the standards used.

**Determination of basal metabolism of the albino rat from the insensible loss of weight,** J. A. GREENE and R. P. LUCE (*Jour. Nutrition, 4 (1931), No. 3, pp. 371–378, fig. 1*).—An apparatus has been developed for determining the insensible loss in weight of rats and used for the purpose of calculating basal metabolism, as suggested by Johnston and Newburgh for human beings (E. S. R., 65, p. 792). At an environmental temperature of from 25 to 31° C., the heat lost by vaporization of water averaged 23.81 per cent of the basal heat produced, with a maximal variation of 13.3 per cent. "Under these standard conditions the respiratory quotient of the albino rat is about 0.72, and the water of vaporization is approximately 100 per cent of the insensible loss of weight. Insensible loss of weight per hour×0.58×100/25×24 equals calories per 24 hours."

**The basal metabolism of Oklahoma women,** C. M. COONS (*Amer. Jour. Physiol., 98 (1931), No. 4, pp. 692–697, fig. 1*).—The basal metabolism studies conducted on women students at the Oklahoma Agricultural and Mechanical College noted from a preliminary report (E. S. R., 64, p. 789) have been extended to a total of 101 subjects whose ages ranged from 17 to 36 years. The greater number were from 18 to 25 years of age and their weights fell within ±10 per cent of the Wood standards.

The average values for the entire group were 1,245 calories per 24 hours, 32.6 calories per square meter per hour, 22.5 calories per kilogram of body weight, and 7.7 calories per centimeter of height per 24 hours. The average calories per square meter per hour, using the height-weight formula, were 13.2 per cent below the Du Bois and 10.1 per cent below the Harris-Benedict and Dreyer predictions. The individual values for calories per square meter per hour in the 17-, 18-, and 25- to 29-year-old groups and in 92 per cent of the entire number fell within a range of ±10 per cent from the averages of the respective age groups in which the subjects belonged, and a ±15 per cent range included all but 1 of the 101 subjects. The individual values in 86 per cent of the 18-year-old group and 71 per cent of the entire number were below the —10 per cent limits and 37 per cent below the —15 per cent limits of the Du Bois standards.

Slightly higher values were obtained for the 25- to 29-year-old group than for the others. This group consisted of advanced nutrition students of the junior and senior years. To determine whether or not the higher values might represent a more select group, a comparison was made of the average calories per square meter per hour of 39 advanced nutrition students and the same number of nonnutrition students of the same ages, 20 to 29 years, but of varied academic standing, all being within ±15 per cent of standard weight. The averages by season for the group of nutrition students were consistently higher than for the other group, and this difference was shown even more clearly by distribution graphs for the two groups.

The results are thought to emphasize the inapplicability of present standards to southern women and the fallacy of basing standards intended for general application on observations of single homogeneous groups.

**Basal metabolism in relation to nutritional status,** C. M. COONS (*Amer. Jour. Physiol., 98 (1931), No. 4, pp. 698–703, fig. 1*).—Basal metabolism studies are reported for 38 overweight and 80 underweight women students at the Oklahoma Agricultural and Mechanical College. The subjects were from 17 to 28 years old and with weight extremes of —29 to +102 per cent of the normal according to the Wood standards. "The overweight women tended to metabolize at a higher rate, the underweight at a lower rate, whether expressed as total calories, calories per centimeter, or calories per square meter, and the reverse was true when heat production was expressed as calories per kilogram.

"The effect of undernutrition and overnutrition tended to manifest itself even when the weight variations were slight, between 10 and 15 per cent above or below the average. The magnitude of the basal metabolism deviation tended to increase with the weight variation, but not in the same proportion. The basal metabolic rates in 84 per cent of these cases were within the ±10 percentage range, 94 per cent within the ±15 when compared to averages per square meter for Oklahoma women."

**Phenomena of retarded growth,** A. H. SMITH (*Jour. Nutrition, 4 (1931), No. 3, pp. 427–442*).—This review, which is based largely upon the investigations of the author and various associates, is presented under the headings methods of retarding growth, resumption of growth, change in body form, weight and composition of bones, changes in organs, effects upon the blood, and influence on behavior. A bibliography of 25 titles is appended.

**Food intake in pregnancy, lactation, and reproductive rest in the human mother,** C. F. SHUKERS, I. G. MACY, E. DONELSON, B. NIMS, and H. A. HUNSCHER (*Jour. Nutrition, 4 (1931), No. 3, pp. 399–410*).—This report contains a record of the caloric, protein, fat, carbohydrate, calcium, and phosphorus intake at intervals during an entire reproductive cycle of the three subjects of the extensive investigation of metabolism during the reproductive cycle (E. S. R., 63, p. 488) and of human milk flow (E. S. R., 64, p. 94). The dietaries were entirely self-chosen and included the foods the women liked and thought to favor milk flow.

In all cases there was a greatly increased food consumption during lactation. The average daily caloric intake of the three subjects during pregnancy and lactation, respectively, were 3,300 and 4,200, 2,900 and 4,500, and 2,600 and 3.800 calories. The average percentage increases in various food essentials for the three subjects were calcium 77, phosphorus 73, carbohydrate 68, energy 60, fat 57, and protein 54 per cent. There was a slight decrease in food consumption toward the end of pregnancy, but no constant decrease near the end of lactation. The average consumption during the post-lactation period was approximately the same as during pregnancy.

The total amount of food eaten and the proportion of various food constituents selected by each of the women varied considerably from day to day. No seasonal differences in food selection were evident.

**The influence of diet on the motor and trophic functions of the colon in rats, F. Hargreaves, A. A. Fletcher, and W. H. Dickson** (*Roy. Soc. Canada, Trans., 3. ser., 25 (1931), Sect. V, pp. 197, 198, pls. 3*).—The observation that in patients with chronic arthritis, suffering from colonic atony to an extreme degree, partial or complete restoration of tone was brought about by diets high in vitamin B and low in carbohydrate led to a laboratory investigation of the factors inducing changes in the tone of the colon. Young rats on the Chick and Roscoe vitamin B-free diet were given vitamins $B_1$ and $B_2$ in the form of dried brewer's yeast and vitamin $B_2$ in the form of autoclaved yeast in varying amounts. In a few cases the carbohydrate content of the diet was increased from 60 to 80 per cent. The condition of the colon of each of the rats was examined periodically by the injection of a suspension of barium sulfate by rectum while the animal was under an X-ray screen.

The tone of the colon was best when dried yeast was given in amounts of between 3 and 5 per cent. Loss of tone was noted to an increasing degree following decreases in the amount of yeast and consequently of vitamin $B_1$, but was evident even when vitamin $B_1$ was given in amounts considerably greater than the minimum dose for the prevention of beriberi. This is thought to indicate that the loss of tone of the colon is a much more sensitive index of lack of vitamin $B_1$ than is the appearance of beriberi symptoms. Although vitamin $B_1$ deficiency is thought to be the principal factor in decreasing the tone of the colon, an insufficiency of vitamin $B_2$ and excess carbohydrate are both thought to increase still further the loss of tone.

**The calcium content of the body in relation to that of the food, H. C. Sherman and L. E. Booher** (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 93–103, fig. 1*).—This investigation supplements an earlier one of Sherman and MacLeod (E. S. R., 54, p. 593). In addition to a further study of the calcium storage in rats raised to definite ages on the two diets of wheat and milk used in the previous study, a series of experiments was conducted in which calcium was made the sole significant variable in diets consisting of artificially purified nutrients, together with enough natural food to insure against deficiencies of possible unknown growth essentials.

In both series of experiments the total calcium in the bodies of the growing animals varied in accordance with the calcium content of the food, but in the animals which were kept on the diets to middle-aged adult life the percentages of calcium were approximately the same regardless of the calcium content of the diet. The animals in the second series grew at practically the same rate on each level of calcium intake and all appeared outwardly to be well nourished, although chemical analyses showed a low calcium content in the bodies of those receiving the smaller amounts of calcium.

The findings are discussed with reference to the earlier studies of Sherman and Hawley (E. S. R., 48, p. 463) on calcium retention in children. It is concluded that "the calcium-poor condition of body in children may coexist throughout much or all of the period of growth, with normal increases of height and weight and with every appearance of good health as indicated by physical examination."

**Further observations on the relation of calcium and phosphorus intake to the hypercalcemia and hyperphosphatemia induced by irradiated ergosterol,** J. H. Jones and M. Rapoport (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 153–166, figs. 3*).—An extension of the studies noted previously (E. S. R., 65, p. 194) to much larger doses of irradiated ergosterol has led the authors to conclude that irradiated ergosterol is capable of mobilizing calcium from stores in the body as well as from the intestinal tract. This view is contrary to the earlier view (E. S. R., 66, p. 96) that the sole source of calcium is the food and not the body tissues.

Studies are also reported on the absorption of calcium and phosphorus from the intestines of dogs following the administration of salts of these elements alone or combined and with and without irradiated ergosterol.

**[Vitamin studies at the Alabama Station]** (*Alabama Sta. Rpt. 1931, pp. 25–39, 42–45*).—Progress in various phases of the investigation of the factors composing the vitamin B complex (E. S. R., 65, p. 494) is noted as follows:

*Histological technique for tissues of the rat*, C. O. Prickett (pp. 25, 26).—Suggestions are given for histological technic, including fixatives, methods of dehydration, clearing, embedding, and staining best suited to certain tissues of the rat (liver and kidney). Of particular significance is the use of a vacuum desiccator for fixation, washing, and dehydration and a Cenco vacuum drying oven for embedding. Necessary precautions are discussed, and the vacuum and time required for the various steps in the procedure are tabulated.

*Relation of basal diets to the pathology of rats receiving an insufficient supply of vitamin G*, C. O. Prickett (pp. 26–29).—Variations in the site and intensity of pathological changes in rats on three vitamin G-deficient diets are described. The three diets were as follows: Diet 2 B—purified casein 18, salts 3.7, agar 1, cornstarch 70.3, butterfat 5, and cod-liver oil 2 per cent; diet 3 G—purified casein 18, salts 4, agar 1, and sucrose 77 per cent, with 0.1 cc. of cod-liver oil per rat per day; and diet 10 G—casein 32, salts 7, agar 1.8, and lard 59.2 per cent, with 0.1 cc. of cod-liver oil per rat per day. The external lesions were most severe on diet 2 B and the internal on diet 10 G, with the lesions on diet 3 G intermediate between those on the other two diets.

*Studies on hydrocephalus occurring in rats on experimental and stock diets*, C. O. Prickett (pp. 29, 30).—A hydrocephalus of unknown origin, first observed in rats which had been on a vitamin G-deficient diet for approximately 20 weeks, is described in detail. The condition was later traced back three generations to a single female. There was no outward evidence of hydrocephalus in the rats observed, but marked gross and microscopic changes in the brain tissues.

*Effect of pH value upon stability of vitamin G*, W. D. Salmon (pp. 30, 31).—To test the theory that the inactivation of vitamin G by alkali, as noted in a previous report (E. S. R., 65, p. 492), might be a reversible reaction, yeast was extracted with 51 per cent (by weight) alcohol and the extract concentrated in vacuo. One fraction of the concentrate was adjusted to pH 6.8 and dried on cornstarch according to the usual method and three other fractions adjusted to pH 2.4, 9.7, and 9.7, respectively, and autoclaved at from 120 to 124° C. for 4 hours. One of the fractions originally adjusted to pH 9.7 was then brought to pH 2.5 and digested at 95 to 100° for 4 hours. All three of the fractions were then brought to pH 6.8 and dried on cornstarch in the same manner as the first fraction, which served as the control. All four preparations were tested for vitamin G at levels of 75 and 150 mg., respectively. The customary technic was followed with the two basal diets 2 B and 3 G, as described above.

The greatest gains were in the control group and the group receiving the yeast adjusted to pH 2.4. The alkaline extract was not improved by subsequent acid treatment.

The results are thought to support the conclusion that autoclaving is more destructive to the growth-promoting function of vitamin G in yeast extracts under alkaline than acid conditions and to indicate as well that the inactivating reaction is not reversible.

Attention is called to the observation that in all experiments in which yeast extracts have been subjected to various treatments marked stimulation of food consumption and consequent gains in weight take place in the first week of feeding the extracts, in some instances the gains being greater than for the entire six weeks following. The author is of the opinion that, whatever the cause, the gains made during the first week after feeding the test material should be disregarded in evaluating the vitamin G potency of the material.

The occurrence of several cases of scaliness in the feet and tails even on the diet containing 5 per cent of butterfat and 2 per cent of cod-liver oil is noted as of significance.

*Symptomatology of rats receiving varying low levels of yeast*, W. D. Salmon (pp. 31–33).—The possibility suggested earlier (E. S. R., 60, p. 596) that vitamin G consists of two substances or groups of substances, one of which supports growth over a period of six weeks or longer but does not prevent the occurrence of certain forms of dermatitis and ophthalmia, and the other prevents pellagralike lesions, has been subjected to further study, with the conclusion that "the relatively heat-stable fraction, vitamin G, may itself contain a relatively labile and a relatively stable fraction. The relatively labile fraction is apparently related to the prevention of certain forms of eye and skin lesions in the rat. Such a hypothesis is apparently in line with our previous findings that when extracts of yeast or plant leaves are concentrated and subjected to certain chemical procedures, their growth-promoting properties may be largely retained without a comparable retention of their ability to prevent certain so-called pellagralike symptoms."

Autoclaving yeast in a moist condition is thought to be less destructive to the relatively labile dermatitis-preventing factor than is heating the yeast in dry form in an electric oven.

*Rats on casein diet develop a condition resembling the egg-white syndrome of Boas*, W. D. Salmon (pp. 33–35).—A condition similar in many of its aspects to the egg-white syndrome of Boas (E. S. R., 57, p. 788) and of Parsons (E. S. R., 65, p. 489) has been observed in rats receiving casein as the sole protein. The condition was first produced to a marked extent in rats on a vitamin A-free diet of casein 18, agar 1, Osborne and Mendel salt mixture 4, and sucrose 77 per cent, with a medicinal cod-liver oil to furnish vitamin A. The casein had been extracted four times with boiling alcohol. The condition was reproduced on the same diet with casein which had been extracted with acidulated water, dried, and heated to 130° for 48 hours. Heated yeast or dried Vegex in doses of from 150 to 200 mg. was protective, as was a dose of 500 mg. of yeast heated for 45 hours at from 130 to 140°.

The gross symptoms, which are described in detail, are considered to resemble more closely those of human pellagra than the irregular cases of dermatitis which occur in rats deprived entirely of vitamin G. Sufficient vitamin G to produce considerable initial gains in weight is thought to be necessary before the condition can be produced. "To supply sufficient vitamin G to meet this requirement without at the same time supplying enough of the other protective factor to prevent the occurrence of the dermatitis presents a serious problem until a chemical procedure for an approximately quantitative separation can be developed."

*Relation of vitamin B to carbohydrate metabolism*, G. A. Schrader (pp. 35–39).—This progress report discusses the selection and standardization of the procedures for comparisons of the blood sugar and glycogen release or formation following the administration of *d*-glucose or *r*-lactic acid to normal and vitamin B-deficient rats and pigeons, and summarizes without specific data the general observations noted. The evidence thus far obtained is thought to indicate "no serious defect in the glycogen formation or glycogen liberation stages in the vitamin B-deficient animal."

*The efficacy of fats in decreasing the vitamin B-requirement of pigeons and rats*, W. D. Salmon and J. G. Goodman (pp. 42, 43).—In this progress report it is noted that lard, previously shown to be effective in decreasing the vitamin B requirements of rats (E. S. R., 65, p. 494), is effective in the same manner in pigeons. Of two samples of lard of the same brand and presumably the same grade, one proved more effective than the other in delaying the onset of polyneuritis. The more effective sample appeared to be a softer lard than the other.

Continuing the study of the vitamin B-sparing effect of various fats on rats, the authors found butterfat fed at a level of 59.2 per cent of the diet less effective than lard at the same level. When rats receiving the diets containing this amount of lard became depleted of their stores of vitamin B, the characteristic symptoms of B deficiency appeared with regularity as compared with the usual deaths from inanition without characteristic signs of beriberi of rats on high carbohydrate-vitamin B-free diets.

The conclusion is drawn that although the vitamin B requirement of pigeons and rats is significantly less on a high fat than on a high carbohydrate diet, there is a definite requirement for this factor even on diets containing as much as 59.2 per cent of fat.

*An improved method for extraction of vitamin B from a fuller's earth adsorbate*, W. D. Salmon (pp. 43–45).—In the method described the fuller's earth adsorbate of vitamin B is washed with 20 cc. of water per gram, followed by 20 cc. of 80 per cent (by weight) alcohol containing 5 per cent glacial acetic acid, and is then extracted at 60 to 65° with a solution prepared by adding 6 cc. of pyridine and 10 cc. of glacial acetic acid to 84 cc. of 80 per cent alcohol. After 8 extractions with 5 cc. of solvent per gram of adsorbate 20 per cent, and after 16 extractions 13 per cent of the activity remains in the solvent. The extract is further concentrated by evaporating to a sirup and treating in five stages with increasing concentrations of alcohol. The final fraction, which is soluble in absolute methyl or ethyl alcohol, retains 75 per cent of the activity of the original adsorbate.

The curative pigeon method of Kinnersley and Peters was found to indicate twice the potency for vitamin B fractions that was indicated by the author's protective method. Although the apparent potency of a given preparation as determined by the curative method, appeared to be affected by the amount of vitamin B administered, sufficiently accurate results for use in following the fractionation of an extract were obtained when the standard adopted was the minimum amount of the substance required per day to produce a cure lasting from 3 to 5 days.

Attention is called to a peculiar incoordination of the muscles of the wings and legs of pigeons on which several curative tests had been tried. This condition, while not yielding immediately to vitamin B therapy, responds to continued treatment after from 18 to 21 days and is cured within the next week or two. "One may raise the question if it is not only in such cases as these that actual nerve lesions occur. The rapidity of the cure which follows the administration of vitamin B in cases of acute beriberi in pigeons is entirely incongruous with the idea of the symptoms being due to a degeneration of nervous tissue."

**The vitamin A, B, C, and G content of Sultanina (Thompson Seedless) and Malaga grapes and two brands of commercial grape juice, E. P. Daniel and H. E. Munsell** (*Jour. Agr. Research [U. S.], 44 (1932), No. 1, pp. 59–70, figs. 7*).—The materials tested included fresh Sultanina (Thompson Seedless) and Malaga (*Vitis vinifera*) grapes and two brands of commercial grape juice, No. 1 a mixture of juices from Flame Tokay and Zinfandel varieties. *V. vinifera*, and No. 2 the juice from Concord grapes, *V. labrusca*.

In the vitamin A tests the method of Sherman and Munsell was followed, with vitamin D furnished by the irradiation of the basal diet. The vitamin B and G tests were carried out by methods similar to those of Chase and Sherman (E. S. R., 66, p. 410) and Sandels (E. S. R., 61, p. 593), respectively. For vitamin C both the method of Sherman, LaMer, and Campbell and that of Höjer (E. S. R., 57, p. 295) were followed. Photographs of sections of the incisor teeth of the guinea pigs used in the Höjer technic are given and explained.

Vitamin A was found to be present in small but measurable quantities in both varieties of grapes, but not in either juice. Vitamin B (antineuritic) was present in fair amounts in both varieties of grapes, the maximum gains in weight occurring on 5 and 6 gm. daily of the grapes. In all cases the growth curves reached a maximum between the sixth and seventh week of the test, after which there was a consistent loss in weight. This is thought to suggest the possibility that another growth essential was absent and that the cessation of growth marked the depletion of reserve stores of this factor. Vitamin B was present in small quantities in juice No. 2 but not in No. 1.

There was no evidence of vitamin C in either juice, the first being tested by the Sherman method and the second by the Höjer method. Quantities as high as 15 gm. of the fresh grapes proved insufficient to afford complete protection of the teeth in the Höjer method. Of the two varieties, the Sultanina contained the greater amount of vitamin C, 15 gm. affording approximately the same protection as 2 cc. of orange juice.

The Sultanina grapes contained a small but significant amount of vitamin G. When fed in 5 gm. daily portions, an average gain of 13.7 gm. for the entire 8 weeks resulted. There was no evidence of G in the Malaga grapes or in either brand of juice.

**Diet as a prophylactic agent against puerperal sepsis, with special reference to vitamin A as an anti-infective agent, H. N. Green, D. Pindar, G. Davis, and E. Mellanby** (*Brit. Med. Jour., No. 3691 (1931), pp. 595–598*).—The authors report statistically significant differences in the morbidity records following childbirth of a group of 275 women receiving a vitamin A concentrate during the month previous to delivery and a group of 85 women from the same clinic not receiving this treatment. The increased resistance to infection in the treated group is thought to afford convincing evidence that vitamin A has a prophylactic as well as therapeutic (E. S. R., 62, p. 294) effect against puerperal septicemia.

The method of action of vitamin A is suggested by two observations on rats, noted briefly. One is that the infective foci found in animals following vitamin A deficiency are particularly prominent in the squamous, columnar, and ciliated epithelium. This is considered of special significance in that "puerperal sepsis is primarily an invasion of the epithelium of the generative organs by pathogenic bacteria." The second observation is that in a large proportion of pregnant rats deprived of vitamin A chronic sepsis develops in the generative tract, while control pregnant rats or virgin rats on a complete diet are usually not affected.

In conclusion the authors emphasize the importance in antenatal welfare work of providing diets rich in natural sources of vitamin A, and recommend the use of cod-liver oil or concentrates of vitamin A and D only when dietary measures can not be followed for economic or other reasons.

**Puerperal infection and dietary deficiencies** (*Lancet* [*London*], *1931, II, No. 15, pp. 805, 806*).—In this editorial comment on the report noted above, previous literature on vitamin A as an antiinfective agent is reviewed briefly, as well as this most recent contribution to the convincing evidence of the importance of vitamin A as a prophylactic against puerperal infection. Attention is called to the deficiency in vitamin A of the diet of many people in England and the particular need of an abundance of this vitamin during pregnancy.

**Effect of vitamins A and D on resistance to infection, L. C. Boynton** and **W. L. Bradford** (*Jour. Nutrition, 4* (*1931*), *No. 3, pp. 323–329, figs. 3*).—Two groups of 4-weeks-old rats were transferred from an adequate stock diet to vitamin A-free and rachitic diets. Half of the animals in each group received no supplements and the other half cod-liver oil and irradiated ergosterol, respectively. Representatives of each group were inoculated intraperitoneally at different times with the bacillus of the mucosus-capsulatus group previously found by one of the authors (E. S. R., 60, p. 689) to be of common occurrence in the suppurative lesions of the respiratory tract in vitamin A-deficient rats. Observations were made of each animal's reaction to the infection and of the post-mortem findings. Those surviving the infective dose were killed 10 days later for examination.

In the group on the vitamin A-deficient diet, 1 animal survived the infection and 22 died in an average time of 10 hours after the inoculation. Of the 23 controls receiving the same diet and cod-liver oil, 6 lived and 17 died in an average of 31 hours. Susceptibility to the infection was evident in those inoculated after only 4 weeks, although the animals were apparently in healthy condition at the time and were growing at a rate nearly equal to those receiving cod-liver oil. In the group of vitamin D-deficient rats 7 lived and 16 died, and of the controls receiving irradiated ergosterol 7 lived and 15 died. The survival periods averaged 24 hours for the rachitic and 34 hours for the control animals. Differences between the two groups were evident only in those animals which had been at least 8 weeks on the deficient diet, at which time rickets was well advanced.

The early susceptibility to infection of the animals on the vitamin A-deficient diet is considered of especial clinical significance as indicating that although classical signs of vitamin A deficiency, such as xerophthalmia, are rarely seen in this country, "it is quite probable that relative degrees of vitamin A deficiency exist, predisposing the individual to various types of infection."

**Is vitamin A an anti-infective agent?** (*Jour. Amer. Med. Assoc., 97* (*1931*), *No. 17, pp. 1229, 1230*).—In this editorial comment, which is based chiefly on the studies of Boynton and Bradford noted above, attention is called to previous "lack of cogent evidence that vitamin A can cure infections when the barrier of the mucous membranes has been passed or that it can prevent or cure infections that enter the blood stream. That is why Cramer [E. S. R., 63, p. 793] and others have opposed the use of the expression 'antiinfective vitamin.' The newer studies pave the way for the possibility, however, that vitamin A may after all do more than maintain the physiologic defenses of the mucous membranes."

**Vitamin D deficiency, dental caries, and tonsillar enlargement: A clinical investigation of some late effects of rickets, H. M. M. Mackay** (*Lancet [London], 1931, II, No. 23, pp. 1230–1235*).—This investigation was undertaken by the author, with the collaboration of S. F. Rose, to obtain evidence for or against the theory that dental caries in school children is due mainly to a deficiency of vitamin D in the first years of life. Two groups of children from 6 to 10 years of age were selected for dental examination, one composed of 46 children who had had definite rickets in infancy and early childhood and the other of 40 children from the same social class who had been under observation at the same hospital at the same ages as the rickets group, but who at that time had shown no evidence of rickets. In the dental examination the main points considered were hypoplasia and crowding of the permanent teeth, the extent of caries at the time of examination, and the number of teeth already extracted for caries.

In the rachitic group 10 children showed hypoplasia of the permanent teeth as against 1 of the control group. In spite of this difference the extent of caries was not significantly greater in the rachitic group than among the controls. The extent of crowding of the permanent teeth and of caries in the temporary teeth was likewise found to be about the same for both groups, and there was no appreciable difference in the tendency to the development of enlarged tonsils or enlarged cervical glands in the rachitic group.

In the opinion of the author "the very similar incidence of dental caries shown in those children who had had rickets and in the controls strongly suggests, if it does not prove, that D deficiency in infancy and early childhood, with consequent hypoplasia of the permanent teeth, is not the main factor in determining the incidence of dental caries. Such a deficiency may be one among a variety of etiological factors, but if it were the predominant causative factor then the incidence of caries in our rachitic group should have been far greater than among our controls. The investigation throws no light on the question whether or not D deficiency in later childhood is a determining factor in the development of caries at this time."

## HOME MANAGEMENT AND EQUIPMENT

**Relationship of the farm home to the farm business, L. A. Studley** (*Minnesota Sta. Bul. 279 (1931), pp. 24, figs. 4*).—This report is based on information secured from farm management records of two so-called "detailed cost routes" over the period 1920–1924. One of these routes was in Cottonwood and Jackson Counties and the other in Steele County. The complete report of the farm management study in the latter county has been noted from Technical Bulletin 44 (E. S. R., 57, p. 285). From the records available, which averaged 22 families for each route, data pertaining to home management were obtained concerning (1) the farm produce used by the farm family, (2) the labor contribution of the family to the farm and of the farmer to the household, and (3) the income available for family living. The size of the families was calculated in terms of adult equivalent as used by the division of farm management and agricultural economics. In calculating the money value of farm products, the prices for which the commodity could have been sold in the local market were used.

The data showed that practically all of the milk, eggs, and potatoes, and much of the meat used by the families studied were supplied by the farm. The average daily consumption of these products per adult equivalent for the families in the Steele County and Cottonwood-Jackson County routes, respectively, were milk 0.79 and 0.43 qt., meat 0.46 and 0.48 lb., eggs 0.94 and 0.94, and potatoes 1.02 and 0.84 lbs. The butter consumption averaged 0.15 and 0.11 lb. per adult equivalent per day, but only 8 per cent of the families on the first route made their own butter as compared with 75 per cent of those on the other route. Pork and poultry were produced for home consumption on practically all of the farms, but few of the farmers produced any lamb, mutton, or veal.

In determining the contributions of the family to the farm and the farmer to the home, records for the Steele County route alone were used. The items considered under the first head were cleaning dairy utensils, other dairy work, poultry, other livestock, and all other work. In calculating the time spent on these tasks the hours were calculated on a man-equivalent basis, but even on this basis the total number of man-equivalent hours of work per farm contributed by the women and boys and girls under 19 years of age constituted 14.5 per cent of the total. Cleaning dairy utensils and work with poultry constituted the chief farm activities of the women. The average time expenditure each day for the 5-year period was practically 0.71 hour for poultry, 0.55 hour on dairy utensils, and about 0.22 hour on the other types of work, a total of 1.48 hours. The distribution of time of the boys aged from 9 to 18 years was 0.96 hour on chores with cows, 0.79 hour on crops and miscellaneous farm work, and 0.16 hour on other livestock and poultry, totaling a little less than 2 adult-equivalent hours. The time spent by girls from 11 to 18 years of age on farm labor was almost negligible, probably because they were chiefly occupied with work inside the home. As against the time spent by women and boys on farm activities, totaling about 3.5 hours a day, the time contributed by the farmer and hired help to activities directly concerned with the interests of the family considered under the headings gardening, furnishing fuel, hauling groceries and supplies from town, and other miscellaneous work averaged only a little more than 0.5 hour a day.

The money available for family living was calculated as the net cash income available from the operation of the farm business. The yearly average for the Steele County route was $1,900 and for the outer route $1,301. The range in both routes was from −$1,025 to $7,475, with 34.8 per cent of the families in the range of from $800 to $1,600 and 23.5 per cent from $1,600 to $2,400. In addition to these money values the farm families had the use of the dwelling, the personal use of the automobile, and the farm produce used for home consumption. The estimated values of the farm dwellings ranged from $282 to $8,000 with an average of about $1,925, and the farm investment ranged from $11,250 to $60,000, with an average of $26,900.

## MISCELLANEOUS

**Forty-second Annual Report [of Alabama Station, 1931],** M. J. Funchess et al. (*Alabama Sta. Rpt. 1931, pp. 56, fig. 1*).—This contains the organization list and a report on the work and publications of the station for the fiscal year ended June 30, 1931. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

**Directory of field activities of the Bureau of Plant Industry** (*U. S. Dept. Agr., Misc. Pub. 129 (1931), pp. IV+120*).—A revision of Miscellaneous Publication 64 (E. S. R., 62, p. 599).

# NOTES

**Delaware College and Station.**—Harry Hayward, director of the station from 1906–1919, as well as professor of agriculture from 1906–1908, professor of animal husbandry from 1908–1918, dean of the department of agriculture from 1907–1919, and director of extension from 1915–1919, died at Devon, Pa., May 4 at the age of 63 years. A native of New York State, Dean Hayward was a graduate of Cornell University in 1894 (M. S., 1901) and had also studied at the University of Minnesota, Hamelin Dairy School in Germany, University College of Reading (England), and the Harvard Medical School. He had been a staff member of the Pennsylvania and New Hampshire Colleges and Stations, assistant chief of the Dairy Division, U. S. Department of Agriculture, and organizer and director of the department of agriculture at the Mount Hermon Boys' School. In 1919 he served as director of the college of agriculture of the A. E. F. University at Beaune, France (E. S. R., 41, p. 101). Since 1920 he had been agricultural adviser of the N. W. Ayer and Son, Inc., advertising agency.

**Florida Station.**—W. W. Henley has been appointed assistant veterinarian.

**Cornell University.**—A new barn has been built for the sheep department, housing 250 ewes and providing space for hay and grain storage. The old dairy barn, located nearby, has been remodeled for housing the experimental flock, accommodating 125 feeder lambs and a like number of ewes.

**North Carolina Station.**—Two incubators of 30,000- and 5,000-egg capacity and other equipment with a total estimated value of over $5,000 have been donated for experimental work with poultry.

**South Carolina Station.**—A new substation, known as the Clemson College Truck Experiment Station, has been established in Charleston County for experimental work with vegetables. A tract of 67 acres, located seven miles south of Charleston on U. S. Highway No. 17, has been deeded to the county for the use of the substation, and the county has appropriated $10,000 for buildings and equipment. The main office and laboratory building is nearing completion at a cost of $5,000, and a deep well water supply with pressure system is being installed at a cost of about $800. Two projects in cooperation with the U. S. Department of Agriculture are being conducted, one with the Bureau of Plant Industry on bean diseases and the other with the Bureau of Entomology on truck crop insects.

**West Virginia University.**—A new curriculum, designed to fit the agricultural student for farm life or for the professional and business fields, is to become effective with the fall term of the university. All candidates for the baccalaureate degree will follow for the first two years a uniform schedule, which includes courses in the sciences which are fundamental to agriculture, as well as certain specified courses in agriculture. During the remaining two years the student is permitted a choice of one of four curricula—agricultural economics, animal industry, plant industry, and teacher training. Certain basic courses in animal husbandry, dairy husbandry, and horticulture are required in each of these curricula. Provision is made also for the student who may wish to pursue a rather broad program of electives during the last two years.

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